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Climate Crisis, Cities and Cultural Heritage: A Case Study of the Island of NGAZIDJA (Comoros)

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Abstract

This study talks about the link between climate crisis, cities and cultural heritage in relation to the evolution of cities in the Comoros, a country with deep African cultural roots on an archipelago in the Western Indian Ocean. It is based on specific cases where the cultural heritage of the Comoro Islands in particular of Ngazidja, is actually affected by the climate crisis. Cities and all representations of cultural heritage face consequences linked to the climate crisis. This climate crisis is linked to natural phenomena, but is primarily caused by the burning of fossils fuels in the industrialized nations. This research work focuses on cities and towns of the coastal areas. Coastal areas are places where most of the towns on the island of gazidja exist. These manifest a strong presence of cultural heritage. In some coastal regions, there are monuments such as tombs and rural mosques and many archaeological sites marking ancient towns and villages. This work demonstrates that the climate crisis generates very varied and specific consequences for the environment of the island of Ngazidja, but relevant to other islands of the Comorian Archipelago and perhaps to many other island nations. The design of cities on the island of Ngazidja must be constructed to survive the rising waters of the Indian Ocean causing sea erosion in coastal regions. Also important is flooding caused by overflowing rivers and heavy rain in some cities and towns of traditional masonry. The presence of the volcano of Karthala on the island of Ngazidja, which is still active, also creates other crises such as volcanic eruptions. The aim of this work is to clarify the situation of cities and other places and the different places where cultural heritage is threatened or endangered due to the climate crisis.

Keywords: Climate Crisis, Cultural Heritage, NGAZIDJA.

Introduction

Many settlements in the Comoros, and on the island of Ngazidja in particular, were established near the coast. Some settlements were abandoned and are archaeological sites; others are still occupied and conserve living traditions and heritage. Climatic crises are not far from these settlements and impacts on coastal archaeological sites. Cultural heritage sites are therefore seriously threatened by this coastal erosion. In addition, the other towns less close to the sea are also linked to climate crises by floods and eruptions. For this research work, we approach the theme "Climate crisis, migration, cities and cultural heritage" [1].

This paper is study of the climate crisis, cities and towns, and their cultural heritages in through the examination of a case study of the island of Ngazidja in the archipelago of the Comoros in the Western Indian Ocean. It will examine the consequences of the climate crisis in certain different environments and on the cultural heritage of Ngazidja as well as their impact.

Context

Comoros is a tropical archipelago in the Western Indian Ocean, with deep cultural roots in Africa. It consists of four principal islands including Ngazidja (Grande Comore), Ndzuani (Anjouan), Mwali (Moheli) and Maore (Mayotte). The Comorian Archi-

pelago is located at the northern entrance of the Mozambique channel between the northwest coast of Madagascar and the east coast of Africa. The Comoros are equidistant (nearly 300 km) from Africa and Madagascar. They are located off the coast of Mozambique between 11° and 13° South latitudes and between 43° and 45° East longitudes (Fig.1).

The islands are characterized by very significant demographic and urban developments with a concentration of populations on the coasts, and by the presence there of a rich archaeological, monumental and urban heritage established more than a millennium ago. Ngazidja is particularly threatened by climate risk, which should translate into by an increase in floods and sea level transforming places as well as cultural heritage. The ancient walled cities and towns are increasingly vulnerable.

Ngazidja is the largest and western-most island in the Comororian Archipelago. The island is made up of three natural regions: the Badjini peninsula in the south, the Karthala massif, a still active volcanic caldera, in the center and the older Grille massif in the north. The coast is typically steep and very often rocky. Coral reefs are well developed in the older northern and southern region [2].

Ngazidja is distinguished by Andosol soils formed on volcanic tephra and ash, but also present in the other islands of the Comorian archipelago and on many of the earths volcanic regions. These soils are rich in minerals and usually very fertile, but the inappropriate exploitation of steep areas and the water erosion caused by high precipitation can cause accelerated land degradation processes. However, these soils are porous and water quicky sinks into deep aquifers. Pools disappear shortly after rain ceases. Ngazidja has no streams and few wells. There are only a scatter of brackish coastal seeps. No doubt this is a major reason why settlement is close to the coasts.

Figure 1: Localization of Ngazidja (Comoros)
Source: Mohamed MAHAMOUD Charahabil, 2018

Cultural Heritage Inventory
Archaeological Sites

These sites are endangered by the phenomena of the climate crisis. The ancient towns of Membeni (Fig.1) and Mbashile (Fig.2), now archaeological sites have been almost completely destroyed by rising sea level in recent years. All of these early sites date from the 8th centuries AD. Earlier sites may be found by future researchers. Occupation during the 11th to 13th centuries is demonstrated by several village sites on the interior, and major port towns, perhaps hidden under lava flows, will certainly be found in the future.

Figure 2: Membeni (Male) archaeological site destroyed by the sea
Source:© Tabibou Ali T, 2016

Figure 3: Shomoni (Mbashile) archaeological site destroyed by the sea
Source: Tabibou Ali T, 2019

Historical Towns and Cities

Apart from archaeological sites, the living towns and cities particularly including residences, palaces, markets, workshops, schools, and mosques where living family traditions, crafts, social ceremonies and forms of worship are valued and performed are threatened heritage sites. Towns and cities have long been vulnerable to natural disasters (volcanic eruptions, floods, etc.) but these on the coasts are now being increasingly threatened by rapid sea level rise (Fig.4). Financial help needed to repair and protect these city walls and important buildings.

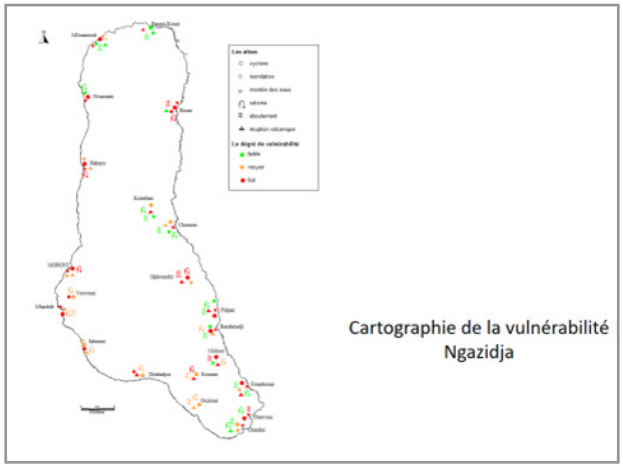

Figure 4: Map of the town and city sites on Ngazidja vulnerable to natural disasters.
Source: Ahmed Abdoulkarim, 2020

Palaces

The various royals palaces long been affected by floods, volcanic flows and often mis-guided efforts at restoration and modernization are now threatened by the phenomena of the climate crisis. The ruins of the royal palace of Mazuini (14th century archaeological site) were completely covered by pyroclastic flow or "lahar" and are now being rapidly damaged the latter phenomenon of sea level rise and consequent erosion. This palace is a part of the cultural heritage inventory this study.

Figure 5: Ruins of the palace of Mazuini affected by the climate crisis
Source: Tabibou Ali T, 2016

City and Town Fortifications

The older coastal towns of Ngazidja and especially the old capitals of the sultanates (Iconi, Itsandra, Moroni, Ntsudjini, Ntsaweni, Fumbuni, Kwambani), were are fortified with masonry walls to protect these towns and cities against enemies coming from elsewhere on the island or from other islands. In the late 18th century AD, these fortifications were strengthened against Malagasy invasions. These fortifications, which are already on the inventory of heritage sites, are in danger from erosion because of rising sea level [3].

Figure 6: Fortification affected by the climate crisis(Ntsaweni)
Source: CNDRS

Figure 7: Fortification affected by the climate crisis (Itsandra mjini)
Source: Cheihani

Mosques

Some mosques with heritage characteristics are also linked to the inventory for this study. The first is the Chiwunda mosque (miraculous mosque) of Bangwa Kuuni. According to tradition, this mosque built itself in one night and another version is about the unknown people who left the building material behind. The other mosque that is concerned in this study is the Wambuzini Mosque of Male in the South East of Ngazidja Island, considered by tradition to be built by Djinns (spirits).

These two mosques date from the 14 century AD according to oral tradition. No archaeological excavation has been carried out to confirm these datings. These two heritage monuments are threatened by sea erosion.

Figure 8: Mosque of Chiwunda affected by the climate crisis (Bangwa Kuuni),
Source: CNDRS

Figure 9: View of the mosque of Wambuzini affected by climate crisis (Male)
Source: Tabibou Ali T, 2016

Tombs

Graves have been observed in archaeological sites threatened by the climate crisis. For example, consider the cases of the graves at the sites of Membeni and Mazuini which are being cut away by the ocean.

Figure 10: Archaeological site of Mazuini, Grave taken by the sea
Source: CNDRS

Figure 11: Archaeological site of Membeni, Grave taken by the sea
Source: Tabibou Ali T, 2016

Climate Crises and Their Impact on Cultural Heritage

Sea Erosion

Several archaeological sites have been destroyed by the sea (Cf. fig.1 and fig.2). Some elements of construction, industry and even tombs have been taken by the ocean. All of these sites date from the 8th to 10th centuries AD period. Several studies have already been carried out (Wright 1984, Horton et alii 2016), but much research remains to be done. If no protective measures are taken for these sites, we will be able to witness only the few sad remnants of the underwater archaeology of this period.

Unless global warming is reversed, in many coastal localities the sea will not stop invading lower areas during times of daily high tides and occasional cyclones. Some areas that have evidence of cultural heritage will inevitably be damaged by the phenomenon of sea level rise.

Figure 12: Town damaged by sea erosion (Foumbouni, April 2019)
Source: Comores Info

Eruptions

Cities and towns with important heritage sites are also affected by natural crises which are not related to climate. Heritage cities are particularly vulnerable to natural disasters such as volcanic eruptions. We will cite the example of the village of Singani which was covered by flows from a volcanic eruption in 1977(Tabibou 2017-2018) (Cf fig.13).

Figure 13: Volcanic eruption of Singani
Source : CNDRS

Flood

To exemplify floods, we consider the floods of Bambao and Hambou in 2012 (Tabibou 2017-2018; Marie-Hélène Chambrin, et alii 2013). The climate crisis is bringing more and stronger storms and more powerful floods. All these phenomena illustrate the natural crises which affect the cultural heritage of the Comoros.

Figure 14: Building flooded in Vouvouni in 2012
Source: Habari za Comores

Figure 15: Building flooded in Vouvouni in 2020
Source: La Gazette des Comores, 2020

The Foreseeable Impacts of Climate Change on Tangible and Intangible Heritage

Climate change has a direct physical impact on the built heritage, both on the appearance of buildings and their structures. Indeed, historic buildings are more linked to the ground than modern buildings. They are more porous, take water from the ground, transport it through their structure and evacuate it by evaporation, generating side effects like oxidation (Cf. fig.5).

Changes in sea level prevent streams from flowing freely, which increases the humidity of the soil and therefore the humidity conditions of the built heritage [4]. These phenomena will generate, beyond an increase in the cost of conservation, a limitation of access to sites, strongly impacting not only tourism, but also the life of communities. Indeed, the climate crisis under the pressure of rising sea levels or increasingly powerful floods can lead people to emigrate, leading to the breakdown of communities and the abandonment of homes, with a possible loss of rites and memorial culture.

Conclusion

The cities and towns and the cultural heritage of the Comoros,

and particularly of the island of Ngazidja, face many present and future crises which must be taken into account in on-going efforts toward better urban designs. If no active measures are taken, there is a risk of having cities and towns with little or no cultural heritage. It will be critically important to safeguard this ancestral heritage for present and future generations. For this, we need study, protection and even subsidization of not only architecture but traditional crafts, arts, events, performances, etc. to prevent the death of the unique cultural heritage of the Comoros.

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