Adaptation to beach erosion in the African coastal cities: from the procrastination by the Government to the forced migration of the most precarious population. The case of Cotonou, Benin

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Introduction

Located in the Gulf of Guinea, the eastern Beninese coast is exposed to fairly rapid erosion since the 1970s [1-3].

This coastal erosion is mainly due to human activities such as:

- sedimentary disturbances caused by the construction of dams including that of Nangbéto on the Mono River;
- the obstruction of the littoral transit by the harbor structures of Cotonou;
- the sand quarries operated on the beach;
- the decrease in sedimentary inputs from the West due to diverse coastal protection constructions.

The coastline has recorded an average maximum erosion of 13.5 m/yr between 1963 and 2000 at 1 km eastwards of the groyne protecting the Eldorado Hotel [1], that is of almost 500 meters in 38 years.

Objectives and methods

Using the multiple dates function in *Google Earth*, we have estimated the eroded area between 2002 and 2011 starting at the Eldorado Hotel. We measured the distance eroded every 100 meters over a distance of 6 km.

Moreover, the number of destroyed houses between 2002 and 2011 were counted on high resolution images. Houses that were destroyed preventively by the authorities were added (Fig. 1 and 2).

Then the number of people forced to migrate was estimated taking into account the average household size in Cotonou, 3.9 persons [3].

We completed the satellite analysis with two field missions in 2012 and 2013.

Results

In total, 53 ha of land were eroded by the sea between 2002 and 2011 on this stretch of 6 km. Coastal erosion is observed until Nigeria, which is 27 km east of Cotonou, with an erosion of 30m in 10 years recorded at the border. This is a novelty because beyond the 6th km east of the groyne protecting the Hotel Eldorado, the coast has been invaded by sand between 1963 and 2000 [1].

In all, 372 houses were destroyed by the encroachment of the sea over the distance of 6 km, of which 311 informal settlements and 61 villas (see Fig. 1 and 2).

Considering the average household size, it appears that 1450 people were forced to leave. More recently, the government has decided to expulse at-risk populations living in informal habitats (Fig. 1). The destruction of these houses without any prior notice nor compensation represents 115 additional houses, that is 450 more people [3]. Then, coastal erosion over the last ten years has displaced, directly or indirectly, 1,900 people east of Cotonou, or 316 people per linear kilometer.

More alarmingly, the recent coastal planning (6 groynes) constructed to protect the coast line cause a more rapid retreat of the coastline to the east of Cotonou, always threatening more precarious populations. Moreover, it is planned - once the coast will be stabilized - that informal settlements will be destroyed (without alternative relocation) in favor of luxurious villas. This urban redevelopment is financially supported by international adaptation funds devoted to climate change impact reduction and the fight against poverty.

Fig. 1: Satellite images available on *Google Earth* within the first 800 meters to the east of the groyne protecting the Hotel Eldorado in 2002 and 2011, The red circle positions the building shown in Fig. 2.

Fig. 2: Illustration of the shoreline erosion and of the destruction of buildings to the east of Cotonou. This building (positioned in a red circle in Figure 1) has been destroyed while it was 100 meters from the beach in 2002 (Photos: Y.C. Hountondji, 2012; P. Ozer, 2013).

Conclusion

This analysis shows that the current impacts of geomorphological changes result mainly from the sum of human activities. However, it is necessary to consider the risk of coastal erosion and forced migration (of mostly poor people) in the coming decades with the amplification of sea level rise due to global warming.

References:

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