

The Present and Future Impacts of Brazilian Coastal Erosion: Pathways for Adaptation

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Opinion

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Over the last years I have been intensively involved in participative research on the adaptation to the impacts of climate change. During this period, I have become increasingly accustomed to how the public generally fails to give proper attention to climate change as major problem affecting most human spheres of activity. Just before submitting this contribution to the International Journal of Oceanography & Aquaculture about climate change related coastal erosion in Brazil, I decided to check what the news outlets were saying about it during the last year. So I turned to Google and looked what the 20 first articles from news outlet were saying about coastal erosion in Brazil. Well, it is not as bad as I had initially thought. Of these articles on coastal erosion, 7 explicitly indicated climate change and consequent increase in sea level as one of the main cause for coastal erosion, although only 2 actually talked about adaptation measures. However, considering how dramatic coastal erosion might be for those affected, the press still understates the importance of climate change. Increasing the awareness on the subject is still crucially needed.

Coastal erosion in Brazil is a wicked problem having economical, social and health consequences. Coastal erosion is global phenomena, which directly affects Brazil. Its causes are multiple and interrelated: land use occupation, modification of hydrosedimentological rivers regime and climate change to mention a few important ones.

The Brazilian coastal zone has an approximate area of 514,000 km² and is 8,698 km long [1], about the same

length as the coast of India (7,500 km), but quite less than the USA (19,924 km) and Canada (202,080 km) for example [2]. About a quarter of the Brazilian population of 208 million lives along the coastline and it is also where most of the Brazilian wealth production occurs. However, climate change socioeconomic impacts are more restricted to the vicinity of the 15 largest coastal cities where the increase in frequency, intensity and magnitude of floods, the vulnerability of people and goods and the reduction of habitable spaces are among the consequences of coastal erosion and rising sea levels [1].

Available data, which is sparse, reveal historical sea level rise from 1.8 to 4.2 mm/year in the last decades [3] which has caused erosion of the coast line of up to 1.1 m per decade, as seen in Florianópolis in the southern part of the country, affecting up to 43% of that city's population [4]. Elsewhere, as in Recife, the sea has advanced 20 meters in Boa Viagem Beach, one of the postcards of the municipality and one of the most valued residential areas of the capital of the State of Pernambuco. The same happens in the city of Santos, which is home to the largest port in Latin America [1].

Outside, or at the fringe of large cities, 40% of the rural population in coastal areas of Brazil lives in poverty. Many of these people depend on agriculture and fisheries, and their survival depends on natural protection barriers, such as mangroves, to shield against extreme weather-oceanographic events, as well as other coastal threats that could be amplified in a climate change scenario [1].

Unfortunately, mangroves, as well as other natural barriers might be at risk due to human encroachment [5].

According to the fifth report (AR5) of the Intergovernmental Panel on Climate Change (IPCC) sea level is projected to rise globally between 0.26 and 0.98 meter by 2100. A similar scenario is predicted for the Brazilian coast. Based on these projections, 8% of the inhabitants of Brazil coastal areas would be affected as a consequence of a 4°C global warming until 2080, but that this percentage could drop to 5% if temperatures were to increase by 2°C –an indication of the relevance of the Paris Agreement. Under the best-case scenario, sea level in the city of Santos, for example, would increase to 30 cm by 2100, but reach 1 m by the same date in a hotter world, leading economic losses close to a billion USD in that sole city [1].

In Brazil, like elsewhere in the world, some of the adaptation measures to address flood and coastal erosion caused by rising sea levels could include natural barriers such as mangrove swaths, beach fattening, floating dykes, and readjustments in the designs of houses and buildings to make them more resilient to the advancement of the sea.

However, top-down implementation of these solutions without participatory processes for the democratization of the access to environmental resources contribute to climate injustice as it implies that it is the economically vulnerable that will suffer the more severe consequences of sea level rise and coastal erosion. Thus, fairness implies that adaptation to climate change and sea-level rise should be related, in a transformative way, with the problems of poverty and marginalization. In this sense, justice should not focus solely on distributive ideals, but instead on the capacities necessary for people to develop free and productive lives they design for themselves [6]. But, designing adaptation for such a complex problem as coastal erosion requires first that people are aware and willing to recognize the nature of the problem at hand.

Recently, I had the opportunity to review an article about the perceptions of climate change by poor coastal communities in Brazil affected by sea level rise. One of the conclusions of the article is that climate change does not even cross their mind as one possible cause. The same can be said of tourist frequenting São Paulo State beaches [7]. It is difficult to imagine how just, inclusive and meaningful adaptation measures can be drawn in these conditions.

If, on one hand, the public still lacks awareness regarding coastal erosion and its link to climate change,

on the other, at the decision maker level, the situation does not seem a lot more encouraging. Although the Brazilian Panel on Climate change has identified the problem, there is still a lack of recognition for the necessity climate change adaptation in public policies [1].

Maybe, like George Marshall says, our brains are wired to ignore climate change [8]. But, then who can rewire them? The press shares the responsibility in educating the public regarding climate change and ensuing coastal erosion. But returning to the small Google survey I mentioned at the beginning, it is still amazing, that journalists, from whom we expect minimally a superficial research before releasing an article, fail to mention climate change in over 65% of their articles. The main concern here is: if they can't relate coastal erosion to climate change, then, who in the lay public will do it?

Ultimately, the responsibility for public awareness ensuring fair participation of vulnerable populations in designing adaptation to sea-level rise rest with the academy and scientists. Who else have the necessary tools to transfer the required knowledge and vision to these actors? At the moment, the Brazilian science community has produced an amazing body of knowledge and is trying to mend important data gaps for decision-making regarding sea level rise and coastal erosion. But producing knowledge and data might not be enough to tackle the issue. Bridging community and academy is becoming the most important step to ensure a decent and dignified life to coastal populations, especially the most vulnerable.

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