

Coastal problems in Mozambique: a developing country case study.

Developing nations represent the majority who will deal with the most severe impacts of climate change. African coastal nations are identified by the Intergovernmental Panel on Climate Change (IPCC) as the most vulnerable to climate change and variability. Issues such as poverty, limited access to capital, ecosystem degradation and political unrest and conflict contribute to the lack of adjustability (Parry, 2007). These problems are exemplified in Mozambique, a country at the tipping point between adaptation and disaster.

Environmental Context

Mozambique is located on the eastern coast of southern Africa and is geomorphologically shaped by the Indian Ocean and the Mozambique Channel. The coastal zone is characterised by strip beaches, recently developed dunes and inland lagoons in the south; mangroves, swamps and low beach ridges in the centre; and mangroves, small dunes and some coastal cliffs in the north (Chemane et al., 1997). A 770km stretch of coral reef is found in the southern portion of the country and contributes to the diverse fish habitat found immediately offshore (Wilkinson, 2002). The inland area of the country is densely covered by savannah and secondary forests and is rich in both land and mineral resources (Chemane et al, 1997). The climate varies between regions but is primarily tropical and defined by the Indian Ocean Monsoon (ICESSE, 2002). The monsoon climate is characterized by wet summer months between October and April, and dry, cooler winter months between April and September. The northern part of the country is influenced by an equatorial low-pressure zone with a northeast monsoon in the warm months; the central region of the country is influenced by a subtropical anti-cyclonic zone; and the southernmost part of Mozambique is a climatic transitional zone, which experiences significantly higher rainfall than the remainder of the country (Chemane et al, 1997).

Coastal Land Use

Mozambique's economy is heavily dependent on coastal resources and infrastructure. Approximately 50% of its population live and work within the coastal zone, increasing pressures on resources and threatening natural systems (Chemane et al, 1997). Two of the most populated urban areas are Maputo and Beira. Each of these coastal communities is briefly profiled below.

Maputo

Maputo is the capital city and the most densely populated and the economy is based on the export of natural resources such as, coal, minerals, cotton, and sugar, and manufactured goods such as rubber and cement (Editorial, 2004; allAfrica, 2008). The city suffers from overcrowding resulting from the civil unrest experienced until the early 1990s (IRIN, 2005). An influx of rural people driven from their homes caused the development of a series of unplanned, make-shift residential complexes. The unplanned nature made the population of Maputo impossible to estimate and therefore the degree of poverty and environmental damage is ultimately immeasurable (IRIN, 2005). The majority of inhabitants live in a low lying coastal slum. The area is subjected to worsening coastal erosion exacerbated by increased storm events (Chemane et al, 1997). In an effort to protect the area from coastal flooding and further erosion, a coastal wall was constructed along a limited beach frontage. Continued wave action and storm surges have undermined this wall, as evidenced in Figures 1 and 2.



Figure 1: BBC News, 2009.



Figure 2: BBC News, 2009.

Lacking resources, the Mozambican government is unable to repair Maputo infrastructure and therefore the population remains at risk to further erosion and flooding events.

Beira

This is another urban area experiencing the effects of coastal erosion, exacerbated by climate change. Located in the central region of Mozambique, Beira is an industrial port city found on the edge of a large estuary (Adgar, 2003). The area is economically pivotal for Mozambique and neighbouring landlocked countries, as its port is the import and export hub for much of the eastern region of southern Africa (Chemane et al, 1997). High levels of dredging in the estuary and within the harbour has increased local currents and left the harbour bottom unstable. Beira has been identified as the most vulnerable Mozambique city to climate change (Chemane et al, 1997). Most of the city is built below the high water mark and subject to reoccurring flooding. Seawalls, groynes and large breakwaters have been constructed along the low lying coastline in an effort to protect residential areas (Gall, 2004). In addition, channels have been cut through alleys allowing water to be directed away from homes during the wet season. Even with such infrastructure in place, Beira has been subjected to severe erosion levels and some property and infrastructure has been lost (Chemane et al, 1997). It is projected that with a minimal rise in sea level, the city will lose the low lying marsh lands that currently act as a naturally protective feature. It is assumed that this will increase flooding and the severity of the erosion along the coast.

Discussion

Maputo and Beira represent a growing global reality. Developing nations are feeling the effects of climate change faster and more intensely than those in the western world. The effects are more severe because of multiple stressors present in countries such as Mozambique. Rapidly increasing and large coastal populations in disorganized settlements immediately adjacent to the coastal zone, creates the potential for devastating levels of damage from increasingly typical storm events. Traditional practices that drive economic activities like fishing and mangrove harvesting undermine remediation efforts, placing larger populations at risk. Governments are unable to allocate sufficient resources to protect the general population without sacrificing basic services. With limited resources, governments of developing countries will continue to be forced to choose between basic livelihood and climate change remediation and mitigation strategies.

Mozambique has two realistic choices with regards to coastal erosion and climate change impacts; to adapt to current and predicted situations or retreat from at risk areas. Currently, the country is being forced to do nothing, placing thousands and potentially millions at risk of

being homeless and unemployed. Adapting will require education and innovation directed at affected communities and retreating from areas most at risk will require the development of new settlements. Unfortunately, this will require further resources and new basic municipal infrastructure. Because communities like Maputo and Beira lack institutional capacity, they have little choice but to ignore the receding coastline. Without properly allocated resources, Mozambique and other developing coastal nations will witness a disastrous loss of their cities. Developing countries need innovation and skills to build adaptive capacity at a grassroots level. This can be achieved through education, proper allocation of resources, and the establishment of strategies for current and predicted effects of climate change. Without the involvement of developed nations, developing countries like Mozambique will be forced to continue to ignore the risks associated with living at the coast.

Recommendations

A series of recommendations suggested to mitigate the impact of climate change are as follows:

Relocate citizens located in high risk areas

Flooding in many areas occurs because of failing protective infrastructure and increased storm severity. The solution suggested, which would protect the greatest majority of citizens, would be relocation to higher ground. This would allow natural processes to occur without human interference or loss. However, moving a population is expensive and carries cultural impacts, but it may be the only option considering the severity of the situation. With well organised funding and proper planning, a relocation effort could be the most successful long-term method to avoid the implications of climate change at the coast.

Develop community based strategies using local knowledge

Coastal processes are natural and have been a factor of Mozambican's lives for generations. Empowering local populations to develop strategies derived from their history and relationship with the sea is a realistic and affordable option. This option would minimize the need for external resources and would require less institutional capacity. There is a risk that these strategies would be focused on short-term and immediate goals, desirable because of quick and tangible results. However, local knowledge is a realistic method to sustain a population as it represents a local community's capacity for accountability and ownership.

International community involvement

There is much discussion in the international community regarding the importance of adaptive capacity. Developing nations need to acquire skills to deal with the challenges of severe natural processes made worse by climate change. Using local knowledge and developing community level strategies is the first step to building adaptive capacity. The international community must carry the responsibility of ensuring sufficient resources to establish and enforce community strategies. Therefore, developed nations must support community based projects if they are to be successful in lessening impacts of coastal erosion and climate change in the long term.

Conclusion

Developing nations neighbouring the coastal zone will suffer dramatic affects of coastal erosion, with further climate change implications of sea level rise and storm surges. The proportion of people affected needs help from the international community with regards to

financial contributions and educational capacity. Working in partnership with developed countries would allow nations like Mozambique to create coastal mitigation strategies that are realistic, implementable and adaptable. Mozambique cannot afford to do nothing in terms of coastal erosion and its associated damage to human development. Through the support of the international community, Mozambique must decide whether the best solution is to stay and hold the line or retreat and allow nature to take its course.

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