Local coping strategies for climate change around two Marine Protected Areas (MPAs) in Zanzibar

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Abstract

The adverse impacts of climate change threaten on-going development efforts, particularly in Small Island Developing States (SIDS). These impacts have already affected not only the national economic development but also local communities' livelihoods. This research investigates two selected Marine Protected Areas (MPAs) in Zanzibar, Tanzania, in order to discover local coping activities undertaken by communities when impacted by climate change. The collected datasets were analysed and interpreted; finding that local communities acknowledged that Jozani-Chwaka Bay Biosphere Reserve (JCBBR) and Ngezi Nature Reserve (NNR) complexes are exposed to the impacts of climate change, which have increased. Despite agriculture being a vulnerable sector to the impacts of climate change in Tanzania, local communities in the JCBBR and NNR prioritise innovative farming systems as the main alternative basic livelihood and coping strategy. Results also show that there is a discrepancy in the way men and women implement coping strategies.

Keywords: *Marine Protected Areas (MPAs), Livelihoods, Gender, Tanzania*

Introduction

According to the Intergovernmental Panel on Climate Change (IPCC) report (2014), some low-lying developing countries and Small Island Developing States (SIDS) are expected to face very high climate change impacts that could have associated damage and adaptation costs of several percentage points of gross domestic product (GDP). The adverse impacts of climate change threaten on-going development efforts in these countries, particularly in SIDS - which require climate change adaptation to enhance its developing economies - and are low-lying, thus vulnerable to climate-related impacts such as sea level rise and more extreme weather events (RGZ, 2012). In Zanzibar, extreme droughts and changing of precipitation patterns pose serious threats to the coastal environment which is the main source of local livelihoods (Hassan *et al.* 2014). These impacts have already affected not only national economic development but

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also local communities' livelihoods, such as tourism, agriculture, and small and large-scale fishing. Due to such impacts, indigenous people have developed coping strategies to survive with extreme variations of weather and climate. Despite significant adaptation initiatives currently undertaken in Zanzibar, no detailed information on local coping strategies adopted by different communities to protect against the climate change crisis around protected areas is being reported. The main objective of this study is to discover the impacts of climate change and what the related coping strategies adapted by local communities in Zanzibar are, particularly around two selected Marine Protected Areas (MPAs), Jozani Chwaka Bay Biosphere Reserve (JCBBR) and Ngezi Nature Reserves (NNR) complex. Specifically, the study focused on identification of impacts of climate change crisis surrounding the two selected MPAs, studying the local coping strategies adopted by the local communities surrounding the selected MPAs, and providing recommendations for the most beneficial local coping strategies that can possibly be applied to other similar locations.

Methodology

The investigation was undertaken at two selected MPAs; JCBBR, located about 35 kilometers from Darajani (Zanzibar town), and NNR, found approximately 25 km from Wete town in Pemba. The major livelihood activities of the local communities in the study areas are agricultural, petty trade and fishing. A desktop review of government reports and other literature relevant to the assignment was performed. Field data was collected by interviewing 80 respondents living within and around the two selected MPAs. To determine what local coping strategies to climate change impacts are exercised in the study areas, structured and semi-structured questionnaires were used. The collected datasets were analysed using Statistical Package for Social Sciences software. Statistics (averages and median), descriptive approach, paradigm interpretation, graphs, charts, tables and pictorial analysis was done and results discussed.

Findings

There are different perceptions on the impact of climate change on coastal environments. Impacts of climate changes and variability leads to changes in tidal waves, severe beach erosion, changes of coral reef conditions and bleaching, and inundation and displacement of wetlands and low-lying coastal zones in both JCBBR and NNR MPAs. About 40% of the respondents suggested that sea level rise is found to be major climatic factor that leads to multiple impacts on local people's livelihoods.

Image 1: The abandoned board walks at Jozani Chwaka bay complex due to sea level rise (Source: Authors own 2018).

For example, sea level rise resulted in intense coastal erosion, and inundation and displacement of wetlands and low-lying coastal zones. In NNR, sea level rise led to flooding of an important fresh water well that has caused the community dependent on it to abandon their traditional wells due to the fact that the area has been changed to beach. Thus, to fetch such water, they have to wait for the ebb tides when the water recedes. On the other hand, at JCBBR sea level rise has affected community access and tourist visits to the mangrove boardwalks at Jozani, used by local and international tourists to visit the mangroves ecosystem and bird watch, which contributes to major economic activity, and which has subsequently been abandoned (**Image 1**). Research found that sea level rise caused the old fish market at Msuka (around NNR Pemba) to sink, thus local people have established a new fish market toward the seashore (**Image 2**).

Image 2: Shifting of fish market due to the damage caused by sea level rise (Source: Authors own)

In addition, increasing temperatures have been affecting sea grasses, coral reefs and other fishing grounds, with the result that local people leave their customary fishing grounds and go to fish in the nearby MPAs - or the deep sea for those with larger boats and better equipment. It was found that fishermen leave fishing activities and turn to agricultural or any other affordable, safe livelihood activities that are seen to be less vulnerable to climate change.

Despite agriculture being one of the more vulnerable sectors to the impacts of climate change in Tanzania, local communities in the JCBBR and NNR are turning to the agricultural sector as the main alternative basic livelihood and coping strategy due to such changes (**Table 1**). They use innovative farming as a coping strategy in responding to the impacts of climate change, either through the diversification of income-generating activities (including on and off-farm activities) (60%), or the use of improved crop varieties (drought resistant and short growing varieties (14%) and mixed cropping (8%).

***Table 1: Proportion of different coping strategies used by community members to respond to the existing impacts of climate change variability* (Source: Authors own, 2018)**

No.	Coping strategies	JCBBR %	NNR %	Total %
1	Diversification of income-generating activities - on and off-farm activities	33	27	60
2	Improved crop varieties (drought resistant and short growing varieties)	8	6	14
3	Mixed cropping and crop diversification	5	3	8
4	Engagement in deep sea economic activities	1	7	8
5	Local irrigation systems	1	4	5
6	Engage in saving and credit schemes	2	0	2
7	Timing of growing season to cope with changing weather patterns	0	3	3

However, these farming interventions are known to draw much underground (aquifer) water for irrigation and use many chemicals to improve production, thus exacerbating environmental degradation in the water system. It is therefore important that every coping strategy or intervention must be screened before application.

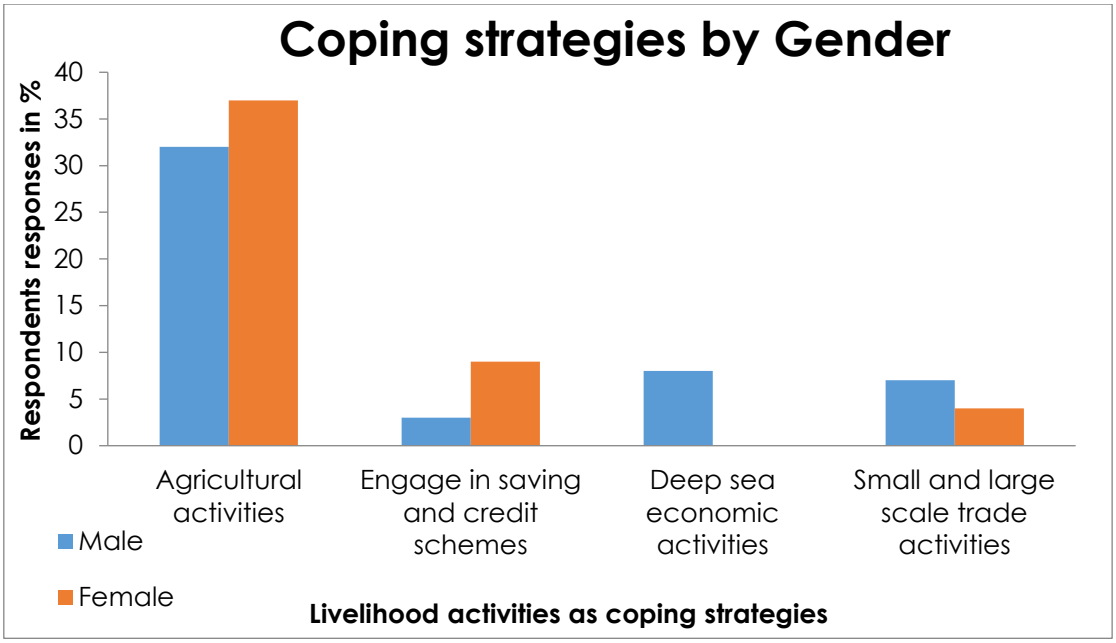

Figure 1. Coping strategies used to respond to the existing impacts of climate change by Gender (Source: Authors own 2018)

When examining the results from the survey in terms of gender, coping strategies used were differentiated by gender. Findings were that females (37%) overall lead males (32%) in using farming activities as coping strategies (**Figure 1**), and females also lead in engaging in saving and credit schemes as their main coping strategies (9%) as opposed to men (3%).

Conclusion

The local communities acknowledged that JCBBR and NNR complexes are under increased exposure and threat to the impacts of climate change, while the communities themselves are becoming more vulnerable to the impacts of climate change due to loss of incomes from abandoned traditional economic activities, such as small-scale fishing. This research provides preliminary information on the impacts of climate change on MPAs, and local adaptation measures relying primarily on innovative farming techniques. Despite the perception of respondents that coping activities do not differ between men and women, results show that identified coping mechanisms of local communities are gender sensitive. Such a finding is significant, and should be integrated during policy preparation for local adaptation strategies; however, the result may differ significantly in other social-cultural settings. This work also provides a platform for learning experiences and scaling-up on appropriate adaptation strategies implemented by local communities, especially in locations of similar developmental needs and climatic impacts

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