



Exploring coastal development scenarios for Zanzibar: A local microcosm-inspired Delphi survey

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ABSTRACT

Tropical coastal systems are undergoing rapid change, which impacts people and natural resources, and that requires innovative governance processes to be turned into an opportunity for sustainable management. Focusing on Unguja, the main island of the Zanzibar archipelago in Tanzania, this study explores the current state of the island's coastal systems, as well as probable and desirable scenarios for the future. Based on a two-round iterative Delphi survey aimed at coastal science & management experts, research priorities are identified, and explorative scenarios are proposed. The findings indicate that demographic pressure is expected to have a high impact, and that competing coastal land use claims balancing between tourism infrastructure development and local fisheries-related land are to be expected. Sustainable alternative livelihood strategies are however expected to be part of the solution, for a resilient coastal system, if inclusive governance and management strategies are put in place, *e.g.* regarding access to coastal resources. This study combines the predictive and normative components of explorative scenarios and its approach and findings can be inspiring in the whole Western Indian Ocean region, beyond the Zanzibar case study.

1. Introduction

Coastal systems are undergoing rapid change worldwide. Tropical coastal systems in particular are home to the greatest combined concentrations of biodiversity and people on earth, exhibit high rates of direct human dependence on nature and a greater diversity of stakeholders, institutions and scales than oceanic or terrestrial systems (Glaser *et al.*, 2012). While all social-ecological systems are typically subject to flux (Valiela, 2009), the pervasiveness and the intensity of coastal change, as well as its high visibility and exemplarity when dealing with edge effects, explain the increased scholarly and political attention for coastal change and its management. Island social-ecological systems in particular, are often unique in terms of biodiversity and endemism, and are typically vulnerable to even minor anthropogenic pressures (Kier *et al.*, 2009). Island social-ecological systems can be considered living laboratories epitomizing global sustainability challenges in times of global change, as their management ideally needs to respond to potentially contradictory demands regarding development and conservation.

Zanzibar, a semi-autonomous territory which forms a political union with mainland Tanzania, is an archipelago in the Indian Ocean. Unguja is the archipelago's largest and most populous island. Zanzibar harbors a diversity of endemic species, including the iconic Zanzibar Red Colobus *Procolobus kirkii* (Nowak and Lee, 2011). The economy is based largely on tourism (contributing 25% of GDP), spices and raffia (Lange, 2015). Marine ecosystem services underpin the social-economic system of the island, and provide approximately 30% of the local GDP). However these resources are insufficiently protected resulting in lost opportunities regarding poverty reduction (Lange and Jiddawi, 2009). The island is experiencing rapid change, with population growth, immigration, urbanization, tourism and the increasing demand of agricultural and forestry products as the main underlying drivers (Kukkonen and Käyhkö, 2014). Changes in land cover in coastal areas can be attributed to shifting cultivation patterns, which are characterized by high land use turnover rates. Moreover, the high pressure on coastal lands has resulted in loss of access to the beach and sea for some villages (*e.g.* due to the development of tourism infrastructure), in turn causing loss of livelihoods (Lange, 2015) and to increasing pressures on

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freshwater availability (Gössling, 2001). Hence Zanzibar is faced with contradictory demands (conservation *versus* development), new challenges originating from distant areas or globally (climate change, international security perceptions regarding tourism in Africa) and local changes in population, land cover and biodiversity. This raises the question of which trajectories of change are possible, which of these are desirable, and for what reason. Sustainability, in itself a multi-dimensional and multi-interpretable concept, is often seen as a consensual and appealing idea to deal with change and to propose a desirable future (Pope et al., 2017). However, sustainability needs to be contextualized and fine-tuned in order to become a useful decision-guiding strategy and in order to avoid overstretched and abusive interpretations (Waas et al., 2011). In order to be a useful concept in Zanzibar too, sustainability needs to be interpreted and translated to the local context, which is one of the aims of this study.

Change itself is a multidimensional concept, and carries with it both the threat of instability and decline, as well as the opportunity for improvement through enhanced livelihoods and environmental conditions. When confronted with change, decision-makers typically need to take into account a plurality of perspectives and knowledge sources, complexity and uncertainty. Scenarios, which represent plausible future states of a social-ecological system, allow to picture trajectories of change, and make it possible for a wide range of stakeholders to design management alternatives in a proactive way. Scenarios can build on models, empirical evidence and stakeholder surveys among other inputs. Scenarios can be used to predict the future (predictive scenarios, focusing on probable outcomes), while they can also be used to imagine the future based on the normative preferences of the scenario-builders (in which case the scenarios allow to sketch a picture of what a desirable future would be) (Börjeson et al., 2006). In the absence of empirical evidence, expert judgement can be used to assess the probability and desirability of change trajectories and adapted management alternatives (Addison et al., 2015). The rigorous use of expert knowledge requires a match between the management and research questions at hand and the knowledge traits of the experts, which can range from a local focus to a global outlook (Drescher et al., 2013). Compiling, assessing and applying expert knowledge requires a commitment to scientific rigor and a critical stance towards various biases in decision-making, hence the need to ‘use experts wisely’ (Sutherland and Burgman, 2015).

This study aims to identify existing knowledge and knowledge gaps on the current state of the Zanzibar coastal system, and to explore probable and desirable scenarios of change, by surveying an interdisciplinary group of international scientific experts.

2. Methodology

We followed a two-step approach to facilitate judgement elicitation regarding coastal development scenarios among a group of interdisciplinary scientists who attended the advanced regional training in marine and lacustrine science (INTEGRATE) workshop in Zanzibar in August 2016. The approach was partly inspired by rapid assessment methods, such as used by Alvarez-Berastegui et al. (2014), in which individual and collective reflection is combined and integrated to inform decision-makers about the multiple aspects that need to be acknowledged in support of sustainable coastal management. All workshop participants were scientists (with different degrees of seniority and covering various disciplines), and all had extensive knowledge about coastal systems. Experts are defined as resource persons who have privileged access to information about systems and/or decision processes and have a high level of aggregated and specific knowledge that is otherwise difficult to access (Otto-Banaszak et al., 2011). This study hence used purposeful sampling, which entails the identification and selection of individuals that are especially knowledgeable about or experienced with a particular topic (Palinkas et al., 2016).

The first step involved a brainstorming exercise by way of a

qualitative mapping of the Chuini Bay area (Unguja, Zanzibar). While all attending scientists had extensive experience in studying human-nature interactions in coastal systems in the Western Indian Ocean (WIO) region, not all of them were familiar with the specificities of the local Zanzibar context. After a range of introductory presentations by experts (e.g. from the State University of Zanzibar (SUZA)) and an unguided, exploratory field visit, participants were asked to draw a map of the Chuini Bay area in which they indicated the different social, ecological and cultural features that they deemed relevant in light of the future sustainability of the small and diverse area. This participatory mapping exercise was performed in groups of four experts, and was followed by a moderated group discussion in which all 4-person groups confronted their views and concerns. The objective of this exercise was to stimulate the participants to look at the Chuini Bay area from different perspectives, and through different –personal, disciplinary, cultural–lenses. The very context of rapid change and the broad future objective of a ‘sustainable coastal social-ecological system’ take people away from well-defined situations, hence the importance of creative thinking. Bell and Morse (2008) advocate the use of participatory mapping as a low-threshold exploratory method suited to the first stages of sustainability assessments *sensu lato*. Participatory mapping has been used in coastal planning e.g. by Klain and Chan (2012). The participatory mapping process allowed the participating experts to familiarize themselves with local coastal development issues. The drawing of these maps served an exemplary function and contributed to convey the image of Chuini Bay as a microcosm, representative for the challenges and future development options of the Zanzibar coast.

Fig. 1 provides an overview of the Chuini Bay area. The map was developed based on Google Maps images on which distinctive features were indicated. The multiplicity of land uses reflects the diversity of demands from stakeholders and the diversity of services provided by the local social-ecological system (which has arguably blurred boundaries). Two small fishing harbours, two lodges (one of them a ‘Responsible Tourism Tanzania’ certified eco-lodge), three hotels, scattered private houses owned by non-Tanzanians and local settlements, and a mix of agricultural fields, coconut and fruit tree groves and coastal scrub, illustrate the coexisting claims of the fisheries, agriculture and tourism sectors. The Chuini Palace ruins are part of the cultural heritage of Zanzibar. The combination of mangroves, beaches and intertidal zones is frequent on Unguja Island, and is representative of the WIO region. Taken together, all these landscape mosaic features make Chuini Bay a microcosm of the Zanzibar coastline, where high-end tourism and ecotourism coexist with local fishermen, agriculture, booming construction and (semi-) natural vegetation.

The second step of our approach consisted of a two-round online survey (administered through Google Forms), following the Delphi technique. The two rounds of the survey had three sections including questions with regard to: i. The current state of the Zanzibar coastal system; ii. Probable scenarios for the future; iii. Desirable scenarios for the future. In Sections 2 and 3, questions were divided into development questions and governance questions respectively. The two rounds of the online survey were completed individually and anonymously by the respondents between August 2016 and March 2017. The Delphi technique is a structured, anonymous and iterative survey of a panel of ‘experts’, and typically aims to address complex issues that require inputs from different disciplines and backgrounds (Mukherjee et al., 2015). The Delphi participants remain mutually anonymous (no participant knows what the other participants are responding), which contributes to address a range of social pressures that affect group-based approaches (biases such as groupthink, halo effects, egocentrism, and dominance are reduced) (Mukherjee et al., 2015). We followed a ‘policy Delphi’ approach, which focuses on obtaining both common and divergent opinions on policy issues, on identifying priorities and potential solutions for policy problems (in our case: coastal management issues in Zanzibar, Tanzania). The Delphi technique has been applied in studies regarding marine governance (Lockwood et al., 2012), coastal

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