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Resolving coastal conflicts using marine spatial planning

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ABSTRACT

We applied marine spatial planning (MSP) to manage conflicts in a multi-use coastal area of Kenya. MSP involves several steps which were supported by using geographical information systems (GISs), multi-criteria decision analysis (MCDA) and optimization. GIS was used in identifying overlapping coastal uses and mapping conflict hotspots. MCDA was used to incorporate the preferences of user groups and managers into a formal decision analysis procedure. Optimization was applied in generating optimal allocation alternatives to competing uses. Through this analysis three important objectives that build a foundation for future planning of Kenya's coastal waters were achieved: 1) engaging competing stakeholders; 2) illustrating how MSP can be adapted to aid decision-making in multi-use coastal regions; and 3) developing a draft coastal use allocation plan. The successful application of MSP to resolve conflicts in coastal regions depends on the level of stakeholder involvement, data availability and the existing knowledge base.

1. Introduction

Most coastal areas of the world are multiple-use areas where different human activities take place. Coastal areas attract a variety of competing uses which sometimes overlap causing adverse effects on each other (user–user conflicts) (Cicin-Sain and Knecht, 1998) or impact on the coastal marine environment (user-environment conflicts) (Burger and Leonard, 2000; Douvere et al., 2007).Consequently many countries are making attempts to manage conflicts between coastal resource users and halt environmental damage.

Integrated coastal zone management (ICZM) (Cicin-Sain and Knecht, 1998) and Ecosystem-based management (EBM) (McLeod et al., 2005) are among the many approaches that have been used to implicitly address the management of conflicts among different coastal resource users. These approaches emphasize integration and balancing of multiple objectives in ecosystem planning process (Christie et al., 2005; UNEP, 2011). GIS is often used within these approaches to enhance spatial management (Vallega, 1999, 2005). Whilst these approaches have enhanced gains in conservation and integrated management, new trends of conflicts are now emerging as demand for coastal resources increase (such as oil and gas, tourism, fisheries and conservation). This calls for more efficient ocean use strategies that balance economy, environmental protection and social demands.

Marine Spatial Planning (MSP) has recently been promoted as one of the strategies that can help address complex conflicts in coastal and marine areas (Ehler and Douvere, 2007; Schultz-Zehden et al., 2008; Ehler and Douvere, 2009). MSP is a way of improving decision-making and delivering an ecosystem-based approach to managing human activities in the marine environment. It is a planning process that enables integrated, forward looking, and consistent decision-making on the human uses of the sea (Ehler and Douvere, 2007). MSP is increasingly being applied to develop marine zoning and allocation plans that address multiple-use conflicts (Gubbay, 2005; Douvere et al., 2007; Ehler and Douvere, 2009; Agostini et al., 2010; Day, 2002). It focuses on management of marine areas where the principal objective is to balance ecological, economic and social interests (Douvere and Ehler, 2008). The inclusion of social criteria in decision-making represents a move towards post normal science where facts are uncertain and the stakes are can be high (Funtowicz and Ravetz, 1994). Multicriteria decision analysis is used as a framework to identify why social conflicts exist and how alternative solutions might be evaluated (Munda, 2004).

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A suite of software based tools are now available for MSP projects (EBM, 2010). There are however few examples of how MSP has been applied in coastal waters which include bays, estuaries and near shore marine waters.

In this paper we report findings of a spatial coastal conflict resolution process that utilized the MSP process. Motivated by the multi-use conflicts (user–user conflicts and user-environment conflicts) in Kenya's coastal area we have attempted to apply MSP to identify existing conflicts and deal with allocation problems. The utility of MSP in determining and addressing coastal conflicts and the implementation challenges are discussed.

2. Methodology

2.1. Study area

This study was carried out in Mombasa's coastal area in Kenya. This area is under the jurisdiction of the Kenya Wildlife Service (KWS) which is legally obliged to make planning decisions for the Mombasa Marine National Park and Reserve (MMNP&R) which covers a total area of 200 km^2. This study focused on the highly used area of MMNP&R measuring 38.08 km^2 (Fig. 1).

The Mombasa coastal area is a complex mosaic of human activities and habitats. The main uses typically fall under fishing, tourism and conservation. The habitats include a reef enclosed lagoon (including its submerged areas of sand/mud flats and seagrass beds) and its shores with extensive sandy beaches. These habitats perform several environmental and biodiversity functions and services including genetic stock of biodiversity, fisheries and tourism (McClanahan et al., 2005). Consequently many users are attracted to this coastal area leading to increased conflicts. The documented conflicts are between: 1) artisanal fishers and tourism operators; (2) conservation and fishing sectors; (3) different fisher groups; and (4) nontraditional beach seine fisheries and trap fishers (Muthiga, 2003; McClanahan et al., 2005; Frontani, 2006). Conflicts are usually exacerbated by different government agencies which are responsible for licensing different activities in the area without appropriate consultation. For example, after the establishment of the MMNP&R, disagreements between KWS and the Fisheries Department increased because of the competing mandates of conservation and increasing fish catches respectively (McClanahan et al., 2005). The Tourism Department also increased the number of licensed water sport activities the MMNP&R as a way of increasing tourism revenues without due regard to environmental damages caused by mass tourism and the resulting conflicts for access. Existing sector regulations are also fragmented and are not well understood or integrated. These conflicts have hindered the effectiveness of management of important ecological areas (Muthiga, 2003, 2009).Emerging conflicts are usually addressed in an *ad hoc* manner because there are no legal instruments for coastal conflict resolution and formal mechanisms to allow stakeholders participation in planning and decision-making processes (Muthiga, 2009). This study therefore undertook to address existing conflicts using a marine spatial planning approach.

2.2. Steps followed in MSP

Conflict analysis and resolution followed the general MSP process based on the work of Ehler and colleagues (Ehler and Douvere, 2009) (Fig. 2). Data describing the coastal marine habitats and human activities was incorporated in the step by step MSP process to guide decisions on conflict and allocation of coastal spaces (Ehler and Douvere, 2009; Gilliland and Laffoley, 2008). Geographical Information Systems (GISs), multicriteria decision analysis (MCDA) (Malczewski, 1999) and optimization techniques (Malczewski et al., 1997) supported the steps in MSP. The four main steps in the MSP were: 1) pre-planning; 2) defining and analysing present conflicts; 3) defining and analysing future conditions; and 4) developing alternative allocation plans. These steps allowed for the inclusion of stakeholders at different stages of the process (Guenette and Alder, 2007; Gopnik et al., 2012). The MSP was devised using a 'bottom up' approach, with top-down steering and guidance.

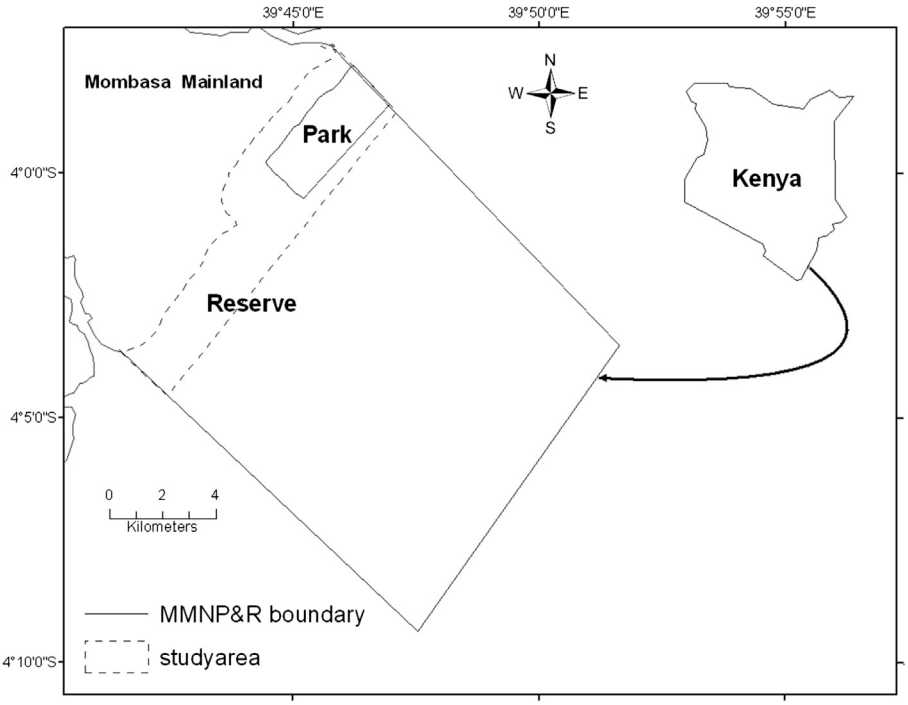

Fig. 1. Map showing location of study area, Mombasa Marine Nature Park and Reserve (MMNP&R), Kenya.