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JAMES COOK UNIVERSITY AUSTRALIA

Evaluation of Management Effectiveness of a Marine Protected Area: A Case Study for Socotra Island, Yemen

Thesis submitted by

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Abstract

Establishing Marine Protected Areas (MPAs) can bring multiple benefits to people and communities, such as increased income from tourism development, and associated benefits from protecting the marine environment. However, the ability of MPAs to conserve marine biodiversity can be constrained, especially when they are poorly planned and the consequences of establishing these areas are not well considered. The establishment of MPAs may have inadvertent consequences such as increased poverty, social tension, conflicts and power struggles in managing these areas when posing new restrictions on resource use. Therefore, it is important to understand whether establishing an MPA has negative consequences or positive benefits to the marine biodiversity and communities living adjacent to the protected area. More importantly, there is a need to improve MPA management because many are not meeting their objectives, including marine biodiversity protection objectives. There is international interest in understanding why MPAs do and don't work and therefore improving their ability to protect natural and cultural diversity. Assessing the success of MPAs requires developing indicators and undertaking evaluative approaches.

A series of indicators, linked to specific criteria, are generally used to assess the management effectiveness of Protected Areas (PAs), including MPAs. The International Union for Conservation of Nature (IUCN)-World Commission on Protected Areas (WCPA) developed an evaluation framework for assessing management effectiveness of these areas. This framework includes multiple criteria which relate to six management elements (*Context, Planning, Inputs, Process, Outputs* and *Outcomes*). Many methods, including the *World Bank (WB) Scorecard Tool*, have been developed to assess management effectiveness of MPAs using indicators against criteria in relation to these elements. However, there is no internationally accepted method for such assessment. Researchers have recommended developing and combining several developed approaches as a comprehensive method to assess the effectiveness of MPAs. Developing approaches for such an assessment is still in the early stages. Consequently, there is a need to design a mixed-approach method if researchers are to progress with assessing the management effectiveness evaluation of MPAs.

My PhD study aimed to design a comprehensive method for evaluating MPA effectiveness, including a broader community survey than has been typically conducted, to assess MPAs and to test this method on the Socotra Island MPA in Yemen. Meeting this overarching aim necessitated different approaches, including: (1) adapting indicators and modifying the scoring system that were used in the *WB Scorecard Tool*, (2) adapting criteria in relation to the six elements addressed in the IUCN-WCPA Evaluation Framework, and (3) developing indicators in relation to an additional element (*Priorities*). Community awareness and stakeholder satisfactions are two broad criteria used in the *WB Scorecard Tool* to help assess management effectiveness of an MPA. This tool used one indicator in relation to each of these two broad criteria. In contrast, I used several indicators in relation to the community awareness and stakeholder satisfaction to help assess the management effectiveness of the MPA. In addition, the *WB Scorecard Tool* does not include community preferences, as a criterion, to help assess the management effectiveness of an MPA. To date, this criterion is not identified as a measure to assess management effectiveness of MPAs in the literature. Aligning community preferences for improving MPA management with a government's priorities was used as a new approach I developed in relation to the element '*Priorities*' to assess the management effectiveness of the MPA.

In this thesis I used two broad approaches to assess the management effectiveness of the MPA. These two approaches were a literature review and a survey of community members. The literature review involved collecting qualitative and quantitative information from available governmental documents, including plans, project progress reports and published papers relating to the MPA management. I also visited the office of the Environmental Protection Authority (EPA) on Socotra Island, which is the Management Authority (MA) for the MPA, to collect secondary data by approaching the senior staff of the MA to update what I found in the literature in relation to the MPA. Socotra Island has an area of 3625 km² with two towns only and about 60 coastal villages. The community survey on this island included Socotrans (n=414) and Yemeni Non-Socotrans (n= 66) living on Socotra Island. The survey was based on a structured questionnaire. Respondents were identified as fitting within 1 of 23 community subgroups, which included *Local Council Officials*, *Fishers* and *Housewives*, at the beginning of each interview and then grouped within 4 key stakeholder groups (*Socotran Decision Maker Group,*

Socotran Primary User Group, Socotran Secondary User Group and Yemeni Non-Socotran Secondary User Group) for analysis purposes. The community survey was conducted in April–May 2011 at 30 coastal locations (2 towns and 28 villages), including remote areas, along most of the coastline of Socotra Island.

Seventy-two indicators were used to assess the management effectiveness of the Socotra Island MPA via a literature review and comprehensive community survey in relation to the seven elements mentioned above. These indicators were represented as questions (For example: '*Does the MPA have a legal status?*' and '*Are the local community satisfied with the current zoning plan of the MPA?'*). Forty-three indicators were used to measure activities conducted by the MA for the MPA management. Twenty-nine indicators were used to explore the community's awareness of several management criteria; participation in management-related activities; satisfaction with many management criteria; and preferences for improving the MPA management.

My results showed statistically significant differences in some responses within and between the four key stakeholder groups. For example, more respondents from the *Socotran Decision Maker Group* participated in MPA management-related activities than those from the other three key stakeholder groups. More respondents from the Socotran User Group were satisfied with the overall management of the MPA than those from the *Yemeni Non-Socotran Secondary User Group*. More respondents from the *Socotran Primary User Group* preferred services available for the locals/fishers than those from the other stakeholder groups.

I found that the managers of the Socotra Island MPA faced five major difficulties for managing the MPA effectively. First, the MA lacked a sufficient budget and did not have a management plan. Second, the MA did not have strong enforcement power with regard to managing increased threats on natural resources. Third, the MPA was not providing obvious flow on benefits to the local communities. Fourth, the majority of the local community was not satisfied with the MPA management. Fifth, the local community's preferences for improving this management were not aligned with the Yemeni government's priorities.

My PhD study showed some differences between results obtained via the literature review and those via the community survey. My study revealed that the MA conducted a large awareness-

raising program and involved a wide array of stakeholders in management-related activities prior to the establishment of the MPA. Despite this, I found that the local community's awareness of the MPA was low and stakeholders' participation in these activities was limited.

My assessment results also varied when they were assessed in terms of the different approaches I used in this PhD study. I assessed the effectiveness of management of the MPA as 'Moderate' in terms of the activities conducted by the MA and community's satisfaction with the MPA management. In contrast, effectiveness was assessed as 'Low' in terms of the community's awareness of the MPA, their participation in management-related activities and aligning their preferences for improving MPA management with the Yemeni government's priorities. Overall, the effectiveness of the MPA management was assessed as 'Moderate', meaning it was inadequate.

The results from my thesis indicate that the ability of the MPA to meet the ecological and socioeconomic objectives addressed in its conservation zoning plan is weak, though the Yemeni government played a significant role in developing the legal status of this area. Based on the findings, I propose multiple recommendations, such as allocating and securing a sufficient operational budget, in this PhD thesis to improve management of the MPA and achieve these objectives. Considering the results and recommendations in this thesis could increase the management effectiveness of the MPA.

The mixed-approach method I designed in this PhD thesis considering and combining several approaches was a valuable evaluation strategy because it provided a thorough understanding of how effectively the MPA was managed. Although this method was costly and time consuming, the final outcome was considered worthwhile, contributing to progress in the evaluation of management effectiveness of MPAs globally. My thesis provides a step towards understanding how a comprehensive community survey can be complementary to the activities conducted by a MA in assessing management effectiveness of an MPA, by providing approaches which are recommended to be adapted for this assessment. The future quality of these approaches could be improved by considering the areas of research, including investigation of correlations between community attitudes and education levels, addressed in this thesis.

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Chapter 1: General Introduction

1.1 Benefits and consequences of Marine Protected Areas

Establishing Marine Protected Areas (MPAs) can bring different socioeconomic and ecological benefits (e.g. Rodríguez-Rodríguez *et al.*, 2015; Ruiz-Frau *et al*.; 2015; Bennett and Dearden, 2014a; Edgar *et al.*, 2014; Pomeroy *et al.*, 2007; Agardy, 2000). MPAs can bring socioeconomic advantages to human communities through increasing employment and tourism revenues, promoting livelihood strategies, protecting traditional culture and enhancing ecosystem service supply (Dudley *et al.*, 2013). Such services include fisheries and medical compounds and non-extractive uses such as SCUBA diving, bird and whale watching. MPAs can bring ecological benefits through protecting or reducing degradation of marine habitats and ecosystems (Selig and Bruno, 2010; Salm *et al.*, 2000). These areas could protect marine resources from destructive fishing practices and anchor damage (Selig and Bruno, 2010) and reduce fishing mortality to levels significantly lower than those in fished areas (Russ, 2002). These contribute to biodiversity conservation as a main ecological benefit (e.g. Edgar *et al.*, 2014). However, the ability of MPAs to bring such a benefit can be associated with social and economic problems, particularly when these areas are poorly planned and the consequences of establishing MPAs are not adequately considered (Agardy *et al*., 2011).

There is a need to understand whether establishing an MPA has consequences or benefits not only to the local marine biodiversity but also to the communities living adjacent to the area. The establishment of MPAs often imposes new restrictions on resource uses leading to an increase in consequences such as increased poverty, social tension, conflicts and power struggles (Bennett and Dearden, 2014a). For example, closing a portion of sea could have associated consequences on those sectors of communities, such as fishing, mining and tourism, affected by the closure (Hattam *et al.*, 2014; Stump and Kriwoken, 2006; Oracion *et al.*, 2005; Christie, 2004), potentially leading to a reduction in income. MPAs can meet a balance between environmental conservation and community needs by applying ecological principles as primary design criteria and including related socioeconomic aspects to ensure

compliance and people support (e.g. Pita *et al.*, 2013; Moore *et al.*, 2004; Walmsley and White, 2003). Considering such a balance could mitigate or reduce the negative consequences associated with MPA establishment, allowing this area to achieve its management objectives effectively.

1.2 Management effectiveness of MPAs

While the number of MPAs worldwide has been greatly increased since the 1980s to cover 2.8% of oceans (Kusumawati and Huang, 2015), previous research suggests many MPAs do not have effective management. For example, Kelleher *et al.* (1995) found only 29% of the 1306 MPAs established globally at the time had effective management; similarly, Alder (1996a) found only 30% of tropical MPAs were effective at that time. More recently Burke *et al.* (2011) found only 15% of 1147 coral reef MPAs worldwide had effective management. These figures raise questions to researchers about whether MPAs are achieving their ecological and socioeconomic objectives effectively (e.g. Bennett and Dearden, 2014a; Edgar *et al.*, 2014; Leverington *et al.*, 2008a).

More attention is needed to improve management of MPAs to achieve effective outcomes for conservation and local communities (e.g. Agardy *et al.*, 2003; Christie *et al.*, 2003; Mascia *et al*., 2003). There is an international agreement to establish MPAs in 10% of the ocean, and a corresponding push towards increasing the number of these areas (De Santo, 2013). The new target of 30% no-take MPA converge worldwide was recommended at the 2014 World Park Congress (www.abc.net.au). However, it is imperative to understand and improve MPA management to achieve ecological and socioeconomic objectives, rather than merely focusing on increasing the number of MPAs (Chaigneau and Daw, 2015). Management Effectiveness Evaluation (MEE) can provide information that can lead to improvements to MPAs as explained in the following section.

1.3 Evaluating management effectiveness of MPAs

1.3.1 Definition of Management Effectiveness Evaluation

Hockings *et al.* (2006, p.vii) define the MEE of Protected Areas (PAs), which include both terrestrial and marine systems, as "the assessment of how well PAs are being managed – primarily the extent to which management is protecting values and achieving goals and objectives". It should be an adaptive process that allows researchers to correct and learn from management mistakes and build on success (rather than criticise such mistakes) (Hockings *et al.*, 2006).

1.3.2 The global interest in evaluating management effectiveness

At the 1982 World Park Congress in Bali, Indonesia, the management effectiveness of PAs was identified as a global concern because many governments worldwide failed to achieve the management objectives, particularly marine biodiversity conservation (e.g. Kelleher *et al.*, 1995). At this Congress, the International Union for Conservation of Nature (IUCN) was called on to develop a system for evaluating management effectiveness of PAs to gain a more logical and transparent basis for planning and allocating resources. This system could indicate whether the activities conducted by governments follow the standard tools for managing an MPA. The interest in the MEE of PAs gained momentum following the 1992 Parks World Congress in Caracas, Venezuela (Hockings *et al.*, 2009). This interest was raised again at the 2003 World Parks Congress in Durban. The 1992 and 2003 congresses laid emphasis on such issues as "How well managed are global PAs? Are these areas meeting their biodiversity objectives?". More recently, relevant issues as "What kind of technology will help people manage PAs effectively?" were also emphasised by the 2014 World Park Congress in Sydney, Australia.

International conventions, including the Convention of Biological Diversity (CBD), international non-government organisations (NGOs), such as IUCN and the World Wildlife Fund (WWF) and intergovernmental organisations, such as United Nations Educational, Scientific and Cultural Organisation (UNESCO), have increasingly considered MEE of MPAs for conserving marine biodiversity since 2000. Maintaining a database on the

effectiveness of MPAs was considered in the 2004 CBD's Program of Work on Protected Areas (PoWPA) (CBD, 2004). This program provided a globally-accepted framework for creating comprehensive, effectively and sustainably funded national and regional PA systems around the globe (www.cbd.int/protected/). The CBD member states commit to report management effectiveness of national PAs to the Secretariat of this Convention (e.g. Hockings *et al.*, 2006). The WWF launched collaborative initiatives with IUCN's Marine Section and the World Bank (WB) in 2000 to enhance understanding of how effectively MPAs worldwide are being managed (Muthiga, 2009). The UNESCO, through the UNESCO World Heritage Centre, also considered evaluating management effectiveness of Natural Heritage Sites (Hockings *et al.*, 2008). Therefore, the combination of different considerations and the practical challenges of managing MPAs have led to a rapid increase in interest in the MEE (Hockings *et al.*, 2006), which could be conducted for a variety of purposes.

1.3.3 Purposes of management effective evaluation

According to Hockings *et al.* (2005) and others (e.g. Leverington *et al.*, 2008a; Day *et al.*, 2003), there are four key purposes for MEE of PAs. These purposes are: 1) promoting better PA management, including adaptive approaches; 2) involving and supporting stakeholders; 3) guiding program or project planning, resources allocation, and priority setting; and 4) increasing community awareness of MPA management. The purpose of any evaluation is not only to inform MPA management, but also to influence action on the ground based on assessment results (Day, 2008).

The results of the MEE of an MPA would help to improve managers' understanding of what is happening to PAs and dealing with the consequences these areas are facing (Hockings *et al.*, 2006). Such results should support the independent stakeholder interests and provide managers with information and expertise or resources to help policy makers make informed decisions. Considering the assessment results could lead to improved management of MPAs, leading towards ecological and socioeconomic objectives being achieved. The most appropriate assessment method to use is addressed in the following section.

1.3.4 Evaluation frameworks

1.3.4.1 General background

An evaluation framework provides guidelines for researchers to conduct an evaluation and can help to organise the purpose of an evaluation. It deals with criteria in relation to elements of a project-cycle management of programs (Stem *et al.*, 2005). Stem *et al.* (2005, p. 306) propose the definition of an evaluation framework as "a representation of the management process and expected results to be considered in an evaluation". The IUCN-World Commission on Protected Areas (WCPA) has designed an Evaluation Framework (Hockings *et al.*, 2006; 2000) for MEE of PAs, which is described below.

1.3.4.2 The IUCN-WCPA Evaluation Framework

The IUCN-WCPA Evaluation Framework (Hockings *et al*., 2006; 2000) includes six elements (*Context, Planning, Inputs, Process, Outputs* and *Outcomes*) for assessment of the management effectiveness of PAs. Each element addresses a major question within three main stages (*Design, Appropriateness* and *Delivery*) as evaluation stages in a project management cycle for MEE of PAs as shown in Figure1.1.

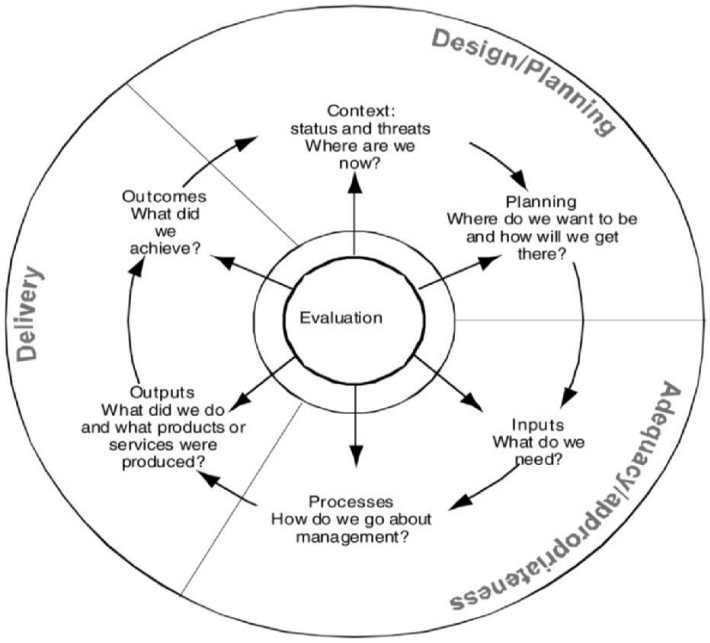


Figure 1.1 The six elements within stages for the management-project cycle for the IUCN-WCPA Evaluation Framework (Source: Hockings *et al.*, 2006; 2000).

The IUCN-WCPA Evaluation Framework (Hockings *et al.*, 2006; 2000) provides multiple criteria to be evaluated in relation to each element as summarised below:

1. '*Context*': e.g. legal status of MPAs, community awareness of the MPA management and stakeholder involvement in management-related activities.
2. '*Planning*': e.g. availability and implementation of a management plan for an MPA, adequacy of legislation and function of zoning design.
3. '*Inputs*': e.g. skills and number of staff, budget allocated and secured for MPA management, facilities and equipment available for this management.
4. '*Process*': e.g. enforcement of legislation, training for staff and maintenance of equipment.
5. '*Outputs*': e.g. services available for visitors and local community and awareness and education materials.
6. '*Outcomes*': e.g. conditions of living resources of MPAs and status of community welfare.

Moore and Walker (2008) conclude that the above six elements would improve the management effectiveness and ultimately the management sustainability in PAs. Ervin (2003a) points out that the IUCN-WCPA Evaluation Framework (Hockings *et al.*, 2006; 2000) is a significant advance in helping to unify the concept of MEE of PAs into a cohesive whole. However, this framework does not focus on a monitoring program approach (Stem *et al*., 2005) or identify indicators for the criteria addressed for each element (Worboys, 2007). "An indicator is a variable that describes the state of a system" (Walz, 2000, p. 613). The IUCN-WCPA Evaluation Framework is a guide only and not a method that can be used for assessing PA effectiveness.

There is a potential for adapting or modifying the IUCN-WCPA Evaluation Framework (Hockings *et al.*, 2006; 2000) to serve as a method for categorising criteria to be evaluated (Worboys, 2007). Many assessment methods for management effectiveness of MPAs have been developed based on this framework, which are described below.

1.3.5 Methods assessing management effectiveness of MPAs

1.3.5.1 Available assessment methods

Over 40 methods for MEE of PAs have been developed (e.g. Cook *et al.*, 2014; Leverington *et al.,*2010; 2008a; 2008b; Hockings *et.al*, 2009; Worboys, 2007) at the international, regional and national levels (see Leverington *et al.* 2010; 2008b). Many organisations – e.g. WB, UNESCO and IUCN– and countries – e.g. Australia, Italy and Egypt – each independently developed methods different to the other. However, no assessment method for evaluating MPAs at the regional level of the Red Sea and Gulf of Aden has been developed by the Regional Organisation for the Conservation of the Red Sea and Gulf of Aden (known by the acronym of PERSGA) or in other countries in the region such as Yemen.

Leverington *et al.* (2008b) consider five international methods for evaluating management effectiveness of PAs, which were designed based on the IUCN-WCPA Evaluation Framework (Hockings *et al.*, 2006; 2000). These methods are: 1) *Rapid Assessment and Prioritization of Protected Area Management (RAPPAM)* (Ervin, 2003b); 2) *Management Effectiveness Tracking Tool (METT)* (Stolton *et al.*, 2007); 3) *Enhancing Our Heritage Toolkit* (Hockings *et al.*, 2008); 4) *WB Scorecard Tool* (Staub and Hatziolos, 2004); and 5) *How is your MPA Doing?* (Pomeroy *et al.*, 2004). The last two methods were designed specifically for the MEE of MPAs. The '*How is your MPA Doing?*' method (Pomeroy *et al.*, 2004) provides detailed guidance applicable to many different MPAs, and helps managers and stakeholders to improve the management of the MPA, but it is not a complete set of indicators or a 'ready-to-apply' method (Leverington *et al.*, 2008b). The *WB Scorecard Tool* (Staub and Hatziolos, 2004) relies largely on available data through literature searches and informed opinions of site managers and/or independent assessors (Leverington *et al.*, 2008b; Van Lavieren and Klaus, 2013) serving as a user-friendly reporting tool on MPAs status within a short period of time for low cost (Leverington *et al.*, 2008b).

1.3.5.2 Lack of an internationally accepted assessment method

Although there are many worldwide assessment methods for MEE of MPAs there is no internationally accepted method to assess management effectiveness of MPAs (Leverington

et al., 2010; Chape *et al.*, 2005). The IUCN-WCPA proposes the Evaluation Framework (Hockings *et al.*, 2006; 2000) rather than an international standard method because PAs, including MPAs, have different situations (Hockings, 2003). Such situations include differences in the nature of management objectives, threats and impacts, and available resources, which all affect the choice of an assessment method to use (Hockings *et al.*, 2005). Other aspects to consider include issues surrounding data types and social scales, which are debatable in the MEE of PAs as discussed in the following section.

1.3.5.3 Debatable issues in evaluating management effectiveness

Data types

Quantitative and qualitative data are applicable in MEE of PAs, though researchers have tended to push for quantitative data in previous research (e.g. Pomeroy *et al.*, 2004). Both qualitative and quantitative data can be used in assessing criteria, such as the adequacy of legislation and conditions of marine resources, respectively, both of which are included in the IUCN-WCPA Evaluation Framework (Hockings *et al.*, 2006; 2000). Researchers recommend the use of quantitative data in conservation evaluations because of challenges such as credibility and costs (e.g. Hockings *et al.*, 2009; Margoluis *et al.*, 2009; Preskill, 2009). However, Margoluis *et al.* (2009) consider that using quantitative data for assessing resource condition is a challenge in conservation evaluations because the biological and physical primary data are difficult to measure and collect, and if the data exist they are often not sufficient for evaluation. Similarly, Day (2008) and Day *et al*. (2003) argue that collecting sufficient quantitative data from monitoring marine communities is a challenge since the biological data for some organisms, including fish, are difficult to measure and collect. Quantitative data from existing monitoring and/or available researches can be used for assessing management effectiveness of PAs (Addison *et al.*, 2015). Sufficient quantitative information in relation to marine resources of MPAs is rarely available because collecting these data can be costly and time consuming (Peckett *et al.*, 2014). Hockings *et al.* (2009) emphasise the need to use detailed information (quantitative and/or qualitative data) for MEE of PAs to inform management decisions.

Social scale

The social scale of assessment for MEE is generally based on traditional jurisdictional boundaries (Bruyninckx, 2009). Whilst Hockings *et al.* (2009) are concerned with the ecological scale, Bruyninckx (2009) argues that it is fundamental that researchers should link the ecological scale with the social scale to gain a comprehensive understanding of the management effectiveness. Considering the social scale within the jurisdictional boundary of an MPA in the assessment could help researchers investigate the extent to where management of this area has reached.

1.3.6 Community involvement in evaluating management effectiveness

1.3.6.1 Defining community and stakeholders

The term 'community' can have several meanings, and can be defined geographically, politically by resource boundaries or socially as a community of individuals with common interests (Pomeroy and Douvere, 2008). In my PhD research 'community' is related to people living within the geographical scope of the case study (Socotra Island MPA) and encompasses all of the varied interests and activities within it including fishing and non-fishing activities.

'Community' is also similar to the term 'stakeholders' defined by Bryson *et al.* (2011) in the general context of an evaluation, although there are several views on its definition (Wallace and Alkin, 2008). Bryson *et al.* (2011) define stakeholders as individuals, groups, or organisations that can affect or are affected by an evaluation process and/or its findings. Hockings *et al.* (2006) include local communities as stakeholders in the context of management effectiveness of PAs, including MPAs. In my PhD research 'local stakeholders' are Yemeni people living on Socotra Island, who can affect or be affected by the assessment process of management effectiveness of the MPA and/or its findings either directly or indirectly.

1.3.6.2 Rationale for involving communities

The need for communities to be involved in all evaluation types, including the MEE of PAs, is addressed in the literature (Bryson *et al.*, 2011; Wallace and Alkin, 2008; Hockings *et al.*, 2006; 2000). Greene (2005, p. 397) defines two main rationales for involving communities as: ‘‘(a) to enhance the usefulness of the evaluation results, processes, or both; and (b) to advance values related to equity, empowerment, and social change within the evaluation context’’. Failure to attend to community interests, concerns, priorities, and perspectives causes a significant problem in thinking or taking action leading to poor management or even crisis (Bryson, 2004). Hockings *et al.* (2006) point out researchers should involve stakeholders in the MEE, at least to understand the level of communication between managers and local communities. Managers are most likely to use evaluation results for adaptive management and accountability purposes (Hockings *et al.*, 2006).

However, the extent to which communities are involved in an evaluation process for MPAs is limited at a global level. For example, Local First Nations that have rights and titles in the Canadian Pacific Rim National Park Reserve were not included in a community survey to increase insights into local stakeholders’ interest and opinions on the content of an MPA evaluation (Heck *et al.*, 2011). Involvement of these communities would have required different data collection mechanisms and a very long time frame (Heck *et al.*, 2011). More efforts are needed to consider involvement of local communities in an evaluation process to avoid poor management and understand whether they participate in management-related activities in relation to an MPA.

1.3.6.3 Communities perceptions, attitudes and preferences

The importance of community involvement in managing MPAs is highlighted in the literature, but little is known about their perceptions, awareness, attitudes and preferences in relation to the management of MPAs (Heck *et al.*, 2012; McClanahan *et al*., 2009; Himes, 2007; Jones *et al.*, 2004; Suman *et al.*, 1999). Vodouhê *et al.* (2010) suggest that understanding perceptions of local communities could help managers involve stakeholders more effectively and improve people’s awareness of biodiversity conservation within PAs.

Raising community awareness of MPAs may promote conservation and gain support for the management of these areas (Kusumawati and Huang, 2015; Bennett and Dearden, 2014a; Jones, 2002; Alder, 1996b). Therefore, it is important to investigate whether local communities are aware of MPAs, including their management. It is also important to explore community attitudes towards management of MPAs to successfully manage these areas (e.g. Jones, 2008). Some researchers conclude that MPAs could fail when stakeholders' attitudes towards management are not positive (Himes, 2007; Dahl-Tacconi, 2005; White *et al*., 2002). Many MPAs also could fail when community inputs and preferences have not been considered in their design and implementation processes (e.g. Marshall *et al.*, 2009; Pomeroy *et al.*, 2007). Therefore, there is a need for more studies to thoroughly understand these social issues.

There is also a need to comprehensively consider community perception, attitudes and preferences as measures of management effectiveness of MPAs to indicate the impact of management of these areas on coastal communities. MPA management has generally been judged by the ability of the MPA to increase organism biomass and diversity (Himes, 2007). It is rarely assessed according to its ability to meet the social, cultural and economic preferences of the local community living adjacent to the MPAs (Russ and Alcala, 1999; Harmelin *et al*. 1995).Current assessment methods, including the *WB Scorecard Tool* (Staub and Hatziolos, 2004), place much more emphasis on measuring activities conducted by a Management Authority (MA) for an MPA management than social issues in the MEE. While it is important to measure such activities, local community opinions should be considered in the assessment to show the extent of effectiveness of actions taken by MAs for managing MPAs and the communication between authorities with other stakeholders. Community awareness and satisfaction were used as measures for the MEE of MPAs in the *WB Scorecard Tool* (Staub and Hatziolos, 2004), but not comprehensively measured as discussed in the next section.

1.3.6.4 Gaps in knowledge

Lack of well-designed approaches that address community awareness and satisfaction in MEE of MPAs

The *WB Scorecard Tool* (Staub and Hatziolos, 2004) addresses stakeholders' awareness of threats as an indicator for assessing management effectiveness of an MPA, but one indicator may not be sufficient if researchers need to thoroughly understand the effectiveness of awareness-raising programs conducted by an MA for this area. Community participation in management-related activities can also be assessed as an indicator to understand whether the MA involved a sufficient array of people. The *WB Scorecard Tool* (Staub and Hatziolos, 2004) also uses stakeholder satisfaction with inputs and outputs of an MPA as one indicator to investigate community attitudes toward management of an MPA. There is a need to specify the types of inputs and outputs and create more indicators to thoroughly understand community attitudes towards an MPA management from different perspectives. Considering several specific indicators of community awareness and satisfaction in relation to MPA management is a more comprehensive approach to assess management effectiveness of MPAs.

Lack of an approach addressing community preferences in MEE of MPAs

'*Priorities*', as a new management element I created in my PhD study, is not addressed in the IUCN-WCPA Evaluation Framework (Hockings *et al.*, 2006; 2000) for the MEE of PAs, including MPAs. This element includes criteria relating to the appropriateness of setting and implementing strategic priority actions and whether these priorities are aligned with community preferences. To date, no known evaluation process includes approaches dealing with the appropriateness of priority actions set by governments or community preferences for improving the management of an MPA. It could be worth including such approaches in assessing management effectiveness to investigate whether community preferences for improving the MPA management are aligned with the government's priorities.

Lack of systematic comparative studies for validity of evaluation via communities

Despite advances in the area of evaluation theory, much remains to be studied and understood. There are no systematic comparative studies that examine whether involvement of communities makes a difference in the way an evaluation is conducted or used (Mark and Shotland, 1985). The need for further research on the ability to conduct effective evaluations

is highlighted in the literature (Taut, 2008). The potential for the improved validity of effectiveness evaluations via stakeholder involvement is a promising area for future research on evaluation (Wallace, 2008). Researchers could investigate whether involving stakeholders is a valid approach in an evaluation process when comparing the assessment results for the same various indicators to be assessed based on a community survey and literature review in MEE of MPAs.

Debatable issues on involving diverse stakeholders

Hockings *et al*. (2006) recommend involving a wide range of stakeholders, including different local communities, in the evaluation process of the management effectiveness of PAs because a participatory process is a part of the PA assessment (Stoll-Kleemann, 2010; Hockings *et al.*, 2006). This process is generally considered essential for credibility and legitimacy (Mathie and Greene, 1997). People with a direct or indirect interest such as journalists and members of the general public may be legitimised in an evaluation process (Weiss, 1998). Different views and opinions are required to evaluate effectiveness of natural resource management (Newman and Dale, 2007; Crona and Bodin, 2006). This in turn could increase the credibility of the evaluation. Accordingly, it may be worth giving weighting to the importance of involvement of diverse community groups in the MEE of PAs, though this is potentially debatable (Hockings *et al.*, 2006) as discussed below.

Researchers question whether it is important to include a range of communities in an evaluation because of the need to balance logistical complexities and resource constraints involved. Alexander (2008) and Mathie and Greene (1997) conclude that fewer groups is sometimes better. These researchers rationalise that involving a wide range of community groups in the evaluation process would be time consuming and costly. Bryson *et al*. (2011) point out that in some processes of evaluation, focusing on a narrow list of potential stakeholders is necessary because community groups do not have equally valid answers for different questions addressed in evaluations. Despite Hockings *et al*. (2006) emphasis on the importance of diverse stakeholders in the MEE of Pas, they point out that in some circumstances involvement of broad community groups is not possible. They suggest that the involvement of local communities and all of the stakeholders within them cannot always be

practical if a large, system-wide evaluation is being undertaken. Yet, these circumstances are typical of large archipelago MPAs in developing countries. Despite the constraints outlined here, it is ideal to include a wide range of stakeholders and communities to assess the management effectiveness of an MPA, but researchers need to determine the best approach based on information needs, the size of the system and available resources in an evaluation process.

1.4 Socotra Island Marine Protected Area

The Socotra Island MPA is within the jurisdiction of Yemen. Socotra Island, with an area of 3625 km², is located 450 km off the mainland coastline of Yemen (Figure 1.2). The Socotra Island MPA was established as a national MPA in 1996 and inscribed within the PERSGA Regional MPA Network (2000), UNESCO Man and Biosphere Reserve (2002) and a Natural World Heritage Site (NWHS) (2008). It is the largest island of the Socotra Archipelago, which is a significant area for marine habitats, such as mangroves, corals and nesting sites for marine turtles (see Cheung and DeVantier, 2006). About 50,000 Socotrans live as natives in this Archipelago, but almost all of them live on Socotra Island (e.g. Elie, 2009). Almost all estimated 1500 Yemeni Non-Socotrans live in the two districts (Hadibo and Qualansya) located along the coastline of the island, particularly in the capital (Hadibo) (Office of Socotra Local Council, personal communication, 2011). The MPA's strategic location, size, international importance, unique marine biodiversity and local communities made it suitable to test an in-depth MEE.

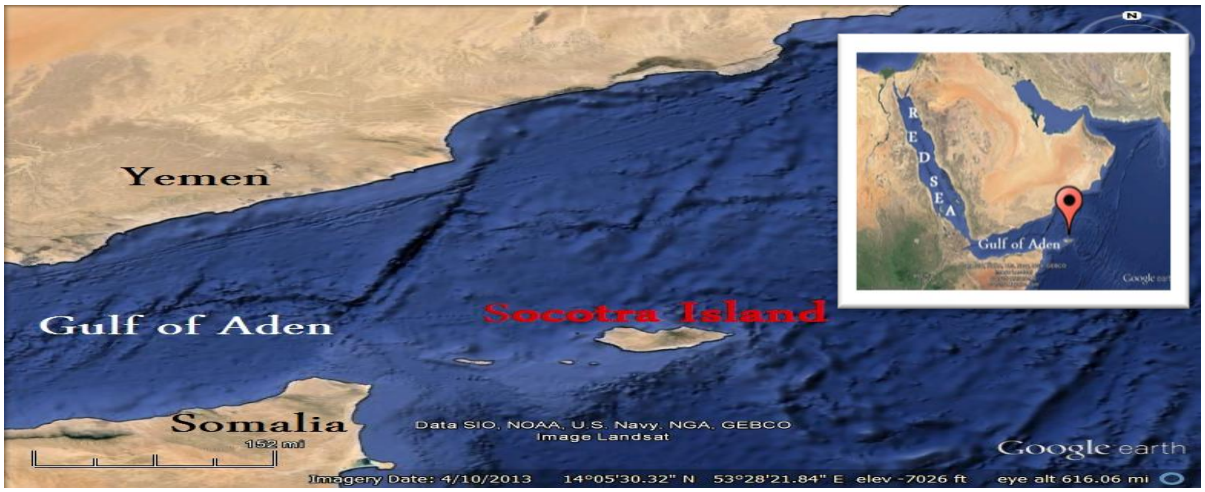


Figure 1.2 Location of Socotra Island, Yemen.

1.5 Possible evaluation approaches

The IUCN-WCPA Evaluation Framework (Hockings *et al.*, 2006; 2000) can be used for assessment of the management effectiveness of the Socotra Island MPA because there is no internationally accepted method. This evaluation framework could be used to adapt and expand existing methods or design new more comprehensive systems, scoring data, or most likely, a combination of both (Hockings, 2003) with ensuring that the assessment process is streamlined, efficient and time effective. Potentially, the most appropriate method for assessing the MPA could be the *Enhancing Our Heritage Toolkit* (Hockings *et al.*, 2008) because this area is listed as a NWHS. However, it could not be fully applied for this MPA because some evaluation criteria in this tool require five years after the listing date of a NWHS and the Socotra Island MPA does not meet such a requirement. The MPA was listed as a NWHS in 2008 and I started my PhD survey in 2011. In contrast, the *WB Scorecard Tool* (Staub and Hatziolos, 2004) is likely to be a suitable method for assessing the management effectiveness of the MPA. Most issues, including socioeconomic-related aspects, are included in this method, which can be modified to increase its accuracy (Staub and Hatziolos, 2004).

Based on the gaps of knowledge and the debatable issues identified in this chapter and summarised in Table 1.1, it would be particularly effective to combine several approaches to assess the management effectiveness of the MPA. Hockings *et al.* (2009) highlight a combination of approaches and methods for evaluating the management effectiveness of PAs in accordance with Greene's (2007) call for methodological pluralism in the evaluation field. Bruyninckx (2009), Preskill (2009), Dahl-Tacconi (2007; 2005), Day *et al.* (2003) and Shadish (1994) highlight such a combination as a complementary comprehensive evaluation. Developing approaches for the MEE of PAs is still in their infancy (Addison *et al*., 2015). I propose to use a combination of several approaches as presented in Table 1.1, considering two broad approaches (a literature review and community survey) with a clear emphasis on the involvement of diverse stakeholders and community groups in the MEE. These approaches are outlined in detailed in the next Chapter. The overarching aim of this thesis is addressed in the following section.

.

Table 1.1 Approaches applied in this thesis to assess the Socotra Island Marine Protected Area (MPA).

Main findings from the literature			References/Sections	Evaluation fields	Approaches considered in this thesis
Gaps in Knowledge	**Broad**	There is no internationally accepted method for MEE of Pas, including MPAs.	Leverington *et al.* (2010; 2008b) and Chape *et al.* (2005).	MEE of PAs.	Design a new method for MEE of an MPA based on the IUCN-WCPA Evaluation Framework (Hockings *et al.*, 2006; 2000) and other tools, mainly the *WB Scorecard Tool* (Staub and Hatziolos, 2004).
		There is no comparative systemic study to prove that community involvement is important in an evaluation process.	Taut (2008), Wallace (2008), and Mark and Shotland (1985).	Program effectiveness.	Compare assessment results obtained via a literature review a community survey and.
	Specific	There is no framework or method that considers aligning priorities set by a government with community preferences for improving MPA management in an evaluation process.	Section 1.3.5.6, Chapter 1.	MEE of PAs.	Create a new management element '*Priorities*' with indicators for MEE of an MPA.
		There is no known well-designed method that considers community awareness and satisfaction in relation to an MPA management in an evaluation process.	Section 1.3.5.6, Chapter 1.	MEE of MPAs.	Develop more specific indicators to assess the management effectiveness of the MPA in terms of community awareness and satisfaction in relation to the MPA.
Debatable Issues	**Community groups**	Involving diverse stakeholders in evaluations is recommended.	Hockings *et al.* (2006; 2000).	MEE of MPAs.	Involve a wide range of community subgroups, including *Handymen*, *Food/Goods Suppliers* and *Housewives* from local Socotrans (n=414) and Yemeni Non-Socotrans (n= 66) in the evaluation process.
		Involving few stakeholders in the evaluation is sometimes better.	Alexander (2008).	Conservation evaluations.	
			Mathie and Greene (1997).	Evaluation in general.	
		Narrowing the list of stakeholders in evaluation stages is necessary.	Bryson *et al.* (2011).		
	Monitoring programs	Effective monitoring is difficult to implement in evaluation.	Peckett *et al*. (2014) and Day (2008).	MPAs management.	Collect information from the literature, including researchers. Visited the MA office in Socotra Island for up-to-date data and clarification.
		Data from monitoring may not be useful for evaluation.	Margoluis *et al.* (2009).	Conservation evaluation.	
		Combining data from existing monitoring /research is highlighted.	Addison *et.al.* (2015).	MEE of PAs.	

Continued Table 1.1

		Main findings from the literature	Reference	Evaluation fields/areas	Approaches considered in this thesis
Debatable Issues	**Other Issues**	Collecting quantitative data is difficult in an evaluation process.	Margoluis *et al.* (2009).	Conservation evaluation.	Obtain detailed quantitative and qualitative data from a literature review and a community survey.
		Collecting detailed information (either qualitative and/or quantitative data) is needed in an evaluation process.	Hockings *et al.* (2009).	MEE of PAs.	
		Considering social scales in evaluations.	Bruyninckx (2009).	Environmental evaluation.	Involve stakeholders and communities, from almost all the coastline of the MPA.
Agreed Issues	**Specific**	Modifying the IUCN-WCPA Evaluation Framework (Hockings *et al*., 2006; 2000) to provide a comprehensive method.	Worboys (2007) and Hockings (2003).	MEE of PAs.	Propose the new management element '*Priorities*' to be considered with the other six elements included in the IUCN-WCPA Evaluation Framework.
	Broad	Combining different approaches and methods is emphasised for evaluations.	Greene (2007) and Shadish (1994).	Evaluation in general.	Consider all approaches mentioned in this column for MEE of an MPA.
			Margoluis *et al.* (2009) and Preskill (2009).	Conservation evaluation.	
			Hockings *et al.* (2009).	MEE of PAs.	
			Dahl-Tacconi (2007; 2005) and Day *et al.,* (2003)	MEE of MPAs.	
Developing MEE approaches are still in their very early stages.			Addison *et al.* (2015).	MEE of PAs.	

1.6 Research questions

The overarching aim of this PhD thesis is to design a method to assess the management effectiveness of an MPA and test it using the Socotra Island MPA as a case study.

I will use a mixed- approach method (outlined above) to address the following research questions:

Research Question 1: *How effective is the Socotra Island MPA in terms of management activities of the MA?*

Research Question 2: *To what extent is the local community aware of different management criteria relating to the Socotra Island MPA and to what extent does the community participate in MPA management-related activities?*

Research Question 3: *To what extent is the local community satisfied with the Socotra Island MPA management?*

Research Question 4: *Are the priorities set by the Yemeni government aligned with the local community's preferences for improving the Socotra Island MPA management?*

Research Questions 5: *How effective is the overall management of the Socotra Island MPA in terms of management activities of the MA and the community's awareness, participation, satisfaction and preferences?*

1.7 Structure of the thesis

This thesis is made up of eight chapters (Figure 1.3), with five data chapters (Chapters 3–7), as outlined below:

Chapter 1: provides a general introduction to this thesis, with a background on the MEE of PAs, before focusing on how an MPA can be assessed for its effectiveness. I then identify key knowledge gaps related to evaluation processes and MEE of MPAs and outline the research framework and questions of this thesis.

Chapter 2: focuses on the research methods, outlining the two broad approaches (a literature review and a local community survey) and scoring system of the *WB Scorecard Tool* (Staub and Hatziolos, 2004) used for assessing the management effectiveness of the Socotra Island MPA.

Chapter 3: provides results for the literature review approach of the assessment. It contains detailed information on the activities conducted by the MA for the MPA management in relation to different criteria, addressed in each of the six elements (*Context, Planning, Inputs, Outputs, Process, Outputs* and *Outcomes*) and the new additional element (*Priorities*) I developed in this thesis for a best practice PA management. I collected such information from available literature plus I visited the MA in Socotra Island and approached the most appropriate management staff for up-to-date information and clarification. In particular, I (1) report the current status of the MPA in detail; and (2) show how effective is the management of the MPA in terms of the management activities conducted by the MA, to answer Research Question 1.

Chapter 4: reports results for on the local community awareness of the MPA management and participation in management-related activities. In particular, I report on community awareness of various management criteria, including the geographical scope, primary objectives and threats in relation to the MPA, and stakeholder participation in such activities, including awareness-raising programs and meetings to answer Research Question 2. In Chapter 4 I also show how effective the MPA management is in terms of community awareness of various management criteria and participation in management-related activities in relation to the element of '*Context*'.

Chapter 5: reports results for the local community satisfaction with the MPA management in general and with different management criteria in relation to each of the six elements addressed in the IUCN-WCPA Evaluation Framework (Hockings *et al*., 2006; 2000). In particular, I report how satisfied stakeholders were with specific criteria relating to the MPA, including their participation opportunities in management-related activities (*Context*), zoning design (*Planning*), management staff capacity (*Inputs*), awareness-raising programs (*Process*), public services (*Outputs*) and the current state of the marine environment

compared with its state before delegation of the MPA (*Outcomes*) to answer Research Question 3. In this chapter I also show how effective the MPA management is in terms of the community's satisfaction in general and with these different management criteria in relation to these six elements.

Chapter 6: reports data on the local community preferences, in general and specific criteria given including the priority criteria set by the Yemeni government to each of the six elements addressed in the IUCN-WCPA Evaluation Framework, for improving the MPA management in the future. In particular, I report on what criteria respondents preferred more than others and show whether their most preferred criteria for improving the MPA management were aligned with the priorities set by the Yemeni government to answer Research Question 4. In Chapter 6 I also show how effective the MPA management is in terms of aligning such priorities with the local community's preferences for improving the MPA management in relation to the new element (*Priorities*).

Chapter 7: combines the results obtained from the literature review (Chapter 3) and community perspectives (Chapters 4, 5 and 6) used as different key approaches to assess the overall management effectiveness of the MPA more comprehensively, and shows how effective the MPA management was in terms of such approaches to answer Research Question 5 in relation to the seven management elements (*Context, Planning, Inputs, Outputs, Process, Outputs, Outcome* and *Priorities)*.

Chapter 8: summarises and discusses the findings from the five data chapters (Chapters 3–7), and considers the implications of my findings for MEE of an MPA. I also highlight valuable directions for future research efforts.

Within the structure of this thesis, some repetitions of text are unavoidable. However, given the interdisciplinary nature of this research, and the disparate fields of study that it encompasses, I consider that the repetition could be helpful for readers to track and understand where and how each chapter fits into this thesis as a whole. I provide a diagram of the thesis (Figure 1.3) at the beginning of each of the chapters highlighting each pertinent chapter for this purpose.

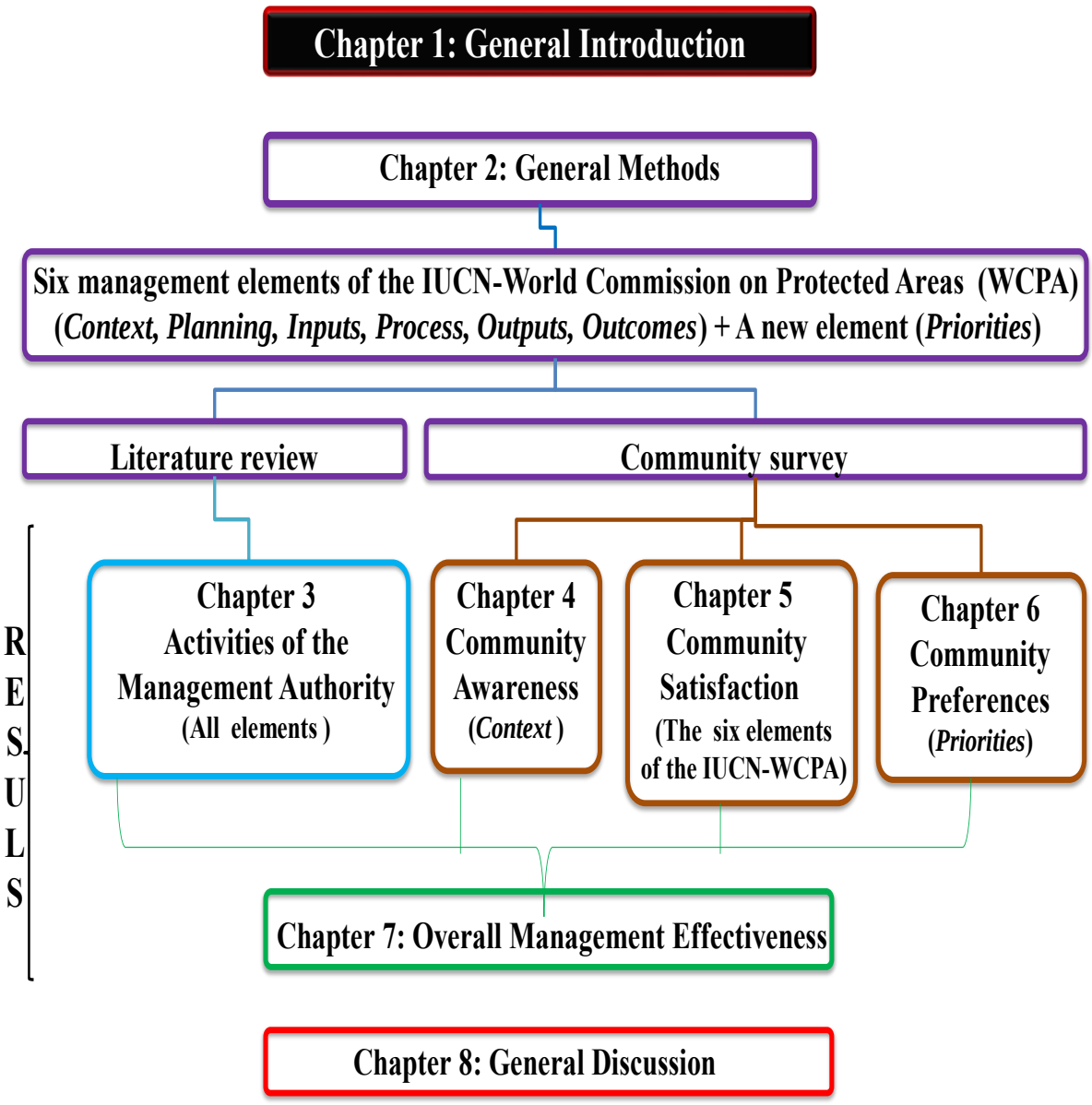
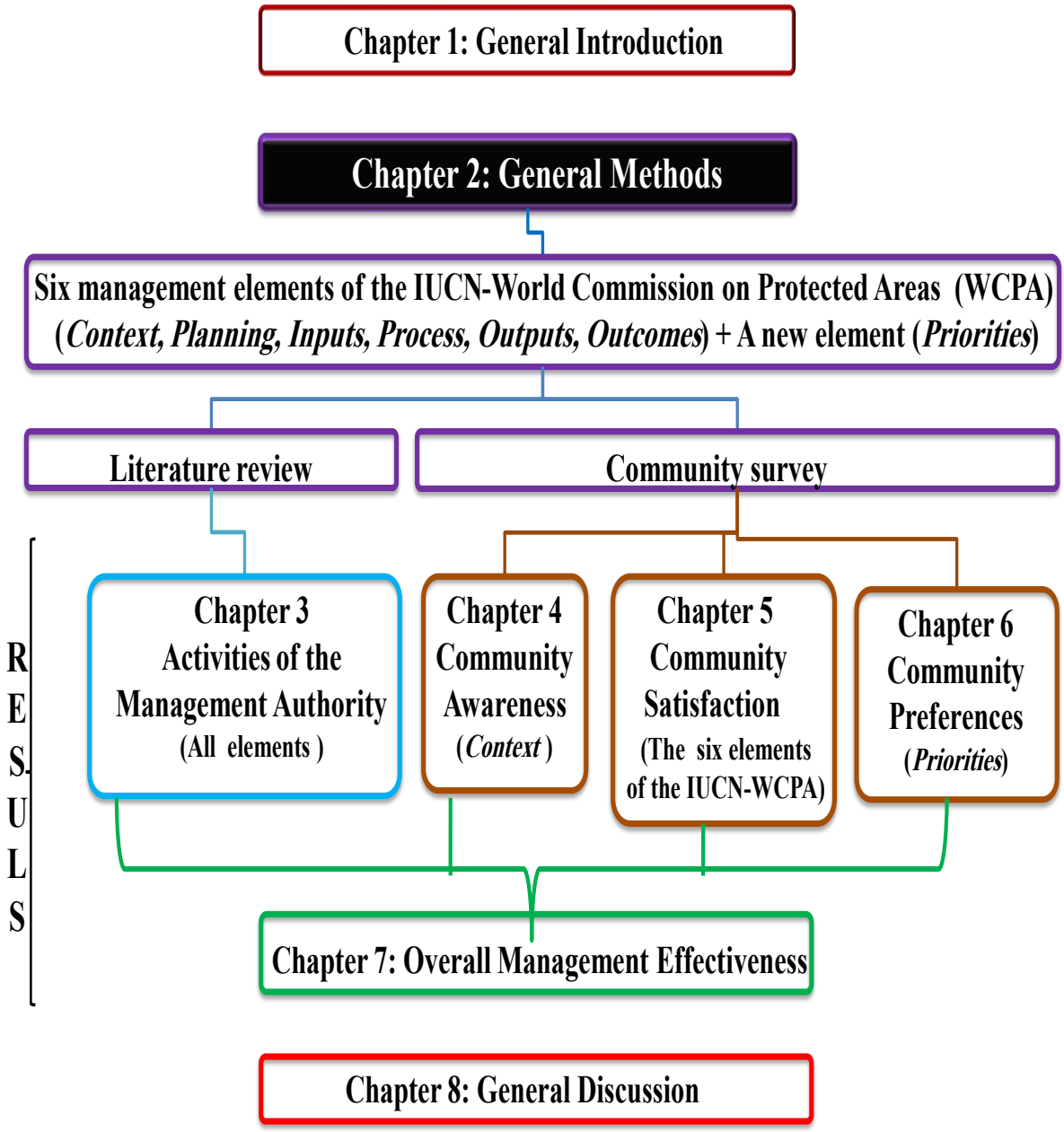


Figure 1.3 The structure diagram of this thesis.

Chapter 2: General Methods



2.1 Study Area

The study area was the Socotra Island MPA in Yemen. Socotra Island is located in the Gulf of Aden, north-west Indian Ocean (see Figure 1.1, Chapter 1). Socotra Island, 3625 km², is the largest island in Yemen and the Arab Middle East (Elie, 2008). The Yemeni Environmental Protection Authority (EPA) is the 'MA' in this thesis, and manages the MPA within the operational framework of the Ministry of Water and Environment. The Yemeni Government legally declared the MPA in 2000 in accordance with the *Presidential Decree No.275 of 2000*. The MPA consists of four different zoning categories in accordance to this decree: Resource Use Reserve, National Park, Nature Sanctuary and General Use Zone. The Yemeni waters surrounding Socotra Island is within these zones (see Appendix A). Section 3.5, Chapter 3, provides more detailed information on the study area.

2.2 Study design

I reviewed the literature and conducted a community survey to collect detailed data in order to design a mixed-approach method for the MEE of the Socotra Island MPA. These broad approaches aimed to answer the research questions of this study outlined in Section 1.6, Chapter 1. The approaches are described below in more detail.

2.2.1 Literature review

Detailed data extracted from the literature included qualitative and quantitative information from available governmental documents, project progress reports and published papers relating to the MPA management (see Section 3.4.1, Chapter 3). I also visited the MA in Socotra Island in April 2011 and February 2013to collect supplementary data and approached the senior staff of this authority to affirm information I found in the literature in relation to the MPA. Collectively, these data provided a greater understanding of the status of the MPA and allowed me to assess the management effectiveness in terms of activities of the MA in relation to Research Question 1(Chapter 3).

2.2.2 Community survey

The community survey was conducted with residents on Socotra Island from April to May 2011. The survey was used to answer Research Questions 2, 3 and 4 (Chapters 4, 5 and 6). It was based on a questionnaire, which is explained below in more detail.

2.2.2.1 Questionnaire

A structured questionnaire with close and open-ended questions (Appendix B) was used for the community survey. This questionnaire included seven, two and two questions to investigate the local community awareness (Chapter 4), satisfaction (Chapter 5) and preferences (Chapter 6) in relation to the MPA respectively. It also included questions on respondents' demographics (age, gender, educational level, and residence period on Socotra Island). The questionnaire was pilot tested with a selection of local community members and managers of the MPA to ensure the questions were clear and understandable and that the average time for interviewing a respondent was appropriate. With the inclusion of a brief introduction, the questionnaire took 30–45 minutes to complete. The questionnaire was in Arabic, conducted via personal interview, and conducted at multiple locations around the Island, as indicated in the following section.

2.2.2.2 Sampling

Locations

The interviews were conducted in 30 coastal locations (2 towns and 28 villages) from different areas located along the coastline of Socotra Island (Figure 2.1). There are only two major towns on the Island: Hadibo and Qualansya. The MA office is located in Hadibo that is the capital of Socotra Archipelago. Almost all Non-Yemeni Socotrans (1500 people) live in Hadibo and Qualansya. Hence, the survey included these two towns. In addition, 28 randomly chosen villages (from about 60 existing villages (2004 Census)), along almost all the coastline of Socotra Island were included, to allow inclusion of a wide social scale from Socotran and Yemeni Non-Socotran communities, as indicated below.

Figure 2.1 Study locations in Socotra Island, Yemen

Respondents

The sample of respondents was 480, including local Socotrans and Yemeni Non-Socotrans living on Socotra Island with diverse demographics (see Table 2.1). There was no accurate data on the population of Socotra Island in 2011. However, the estimated population in 2011, based on the population growth rate (2.5%) since the 2004 Census, was approximately 50,000 (Source: www.worldbank.org). In accordance with O'Leary (2004), with a 95% confidence level and confidence interval of 5, the required sample for 50,000 people is 381, meaning that the 480 respondents obtained was greater than enough for statistical analysis.

The sampling proportion of the male respondents (85%) was greater that the females (15%) for two main reasons. First, I had challenges in interviewing women due to traditional customs in general. Second, it was difficult for a female volunteer to travel to interview women in remote areas during the survey due to traditional customs as well. A local female volunteer was available to interview *Housewives*, as indicated in Section 2.2.2.3, but only in the capital of Socotra and villages close to it.

Table 2.1 Demographics of respondents from the Socotra Island MPA.

Variables	Socotrans (n= 414)		Yemeni Non-Socotrans (n= 66)	
	N	%	n	%
Gender				
Male	352	85	46	70
Female	62	15	20	30
Age				
15–20 years	64	15	4	6
21–30 years	130	32	32	49
31–40 years	103	25	16	24
41–50 years	63	15	12	18
> 50 years	54	13	2	3
Education Levels				
None	68	16	4	6
Adult/Primary schools (1–9 levels)	192	46	18	27
High schools	113	28	16	25
College/University	41	10	28	42
Length of time living on Socotra Island				
< 5 years	3	1	30	46
6–10 years	8	2	16	24
>10 years	403	97	20	30

The respondents were chosen via a stratified random sampling mechanism. This mechanism involves dividing the community into various subgroups and then taking a simple random sample within each one (O'Leary, 2004). This ensures that the sample represents key subgroups of the community. Representation of these subgroups can be proportionate or disproportionate (O'Leary, 2004). The community living on Socotra Island was divided into 24 subgroups, including a '*Tourism Operators*' subgroup. However, respondents from this subgroup could not be approached on the island during the community survey because of a public rally in Yemen, bringing the total of subgroups actually sampled down to 23.

The respondents were identified as fitting within one of these twenty three community subgroups at the beginning of each interview, and then grouped within three key stakeholder groups (Decision Maker Group, Primary User Group and Secondary User Group) which included Socotrans and Yemeni Non-Socotrans (Table 2.2). The Decision Maker Group included subgroups that had decision making power or an active role in relation to the MPA management. These subgroups included the managers and technical staff managing the MPA (*MA Staff*), *Local Council Members, Village Heads, Fishery Society Officials* and *Related*

Governmental Officials, such as directors of fish wealth and tourism offices. The Primary User Group included subgroups that gained direct benefits from the MPA (i.e. incomes). The Secondary User Group included subgroups that gained indirect benefits from the MPA since their incomes did not come directly from the MPA. However, 88% of all Yemeni Non-Socotrans (n=66) were categorised within a Secondary User Group. Hence, the community subgroups were then grouped within four key stakeholder groups (*Socotran Decision Maker Group*, *Socotran Primary User Group*, *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group*) for analysis purposes. Involving a wide array of community subgroups, as conducted for my PhD study, is recommended by Hockings *et al.* (2006) for the MEE of PAs, including MPAs (see Section 1.3.6.5, Chapter 1).

2.2.2.3 Interview strategy

Respondents were interviewed in person (face-to-face and group-administered, Table 2.2) to ensure that the questions were clear. The "face-to-face interviews have the highest response rates and permit the longest questionnaire" (Neuman, 2007, p.190). Group-administered interviews are the best type of survey for getting consistent responses in a short period of time (Phellas *et al.*, 2011). Most of the respondents (77%), including all *Fishers*, *Handymen* and *Village Heads*, were interviewed face-to-face because the majority (59%) had low education levels, as shown in Table 2.1.

The respondents were interviewed at different places, but the majority were interviewed either on beaches for almost all *Fishers* or in their houses for other subgroups, including all *Village Heads* and *Housewives* (Table 2.2). Most respondents from subgroups within the Decision Maker Group, particularly all *Local Council Officials* and *Related Governmental Officials*, were interviewed in governmental offices.

The interviews were conducted in coordination with the MA, but with assistance from four volunteers from the local community to avoid bias in respondent responses. Three volunteers were trained and assisted in interviewing some respondents' face-to-face. For local custom reasons, one of these volunteers was female for interviewing *Housewives*. The fourth volunteer was available for Socotran respondents during interviews. He assisted in explaining the purpose of the questionnaire for clarity and building trust with respondents and/or

translating some questions in the Socotran language because some respondents were unable to thoroughly understand Arabic.

2.2.2.4 Response coding

Responses of open-ended questions were sorted into descriptive categories using inductive analysis after the interviews to describe and classify the range of responses (Patton, 2008). Examining and coding of the different survey questions are elaborated on in Section 4.4, 5.4 and 6.4 in Chapters 4, 5 and 6, respectively.

2.2.3 Management effectiveness

The assessment form of the *WB Scorecard Tool* (Staub and Hatziolos, 2004) was used for the MEE of MPAs based on the results from the literature review and community survey. This form had 34 key criteria represented by questions (for example "*Does the MPA have a legal status*") as indicators to be answered with one of four responses (see Table 3.2, Chapter 3, for responses to this question). The assessment form relies largely on available data (through literature searches), and on the informed opinions of site managers and/or independent management assessors (Van Lavieren and Klaus, 2013). It serves as a user-friendly reporting tool on MPA status that can be applied within a short period of time and at low cost (Leverington *et al.,* 2008b).

I modified and improved the assessment form of the *WB Scorecard Tool* (Staub and Hatziolos, 2004) by using 72 indicators to assess the management effectiveness of the MPA via the literature review and community survey. These indicators were related to the six elements of the IUCN-WCPA Evaluation Framework (Hockings *et al.*, 2006; 2000) and the new element '*Priorities*', as addressed in Chapters 1 and 7.

Table 2.2 Community labels given to respondents from Socotra Island.

Stakeholder group and community subgroup labels	Socotrans n= 414		Yemeni Non-Socotrans n= 66		Interview places	Type of interview-based questionnaire
	n	%	n	%		
Decision Maker Group (n=81)	*77*	*19*	*4*	*6*		
MA Staff	11	14	2	50	Governmental offices	Group-administered
Local Council Officials	12	16	—	—		
Ministry of Fish Wealth Staff	5	6	—	—		
Coast Guards	3	4	1	25		
Tourism Police Officers	9	12	—	—		
Fishery Society Officials	11	14	—	—	Houses and society offices	Face-to-face
Related Governmental Officials	8	10	1	25	Governmental offices	
Village Heads	18	23	—	—	Houses	
Primary User Group (n=221)	*217*	*52*	*4*	*6*		
Tourism Guides	6	3	—	—	An education faculty hall	Group-administered
Fishers	170	78	—	—	Beaches, harbour sites and houses	Face-to-face
Harbour Officers	12	6	—	—		
Ex-Marine Extension Officers	11	5	—	—	Houses	
Other Governmental Staff	14	6	3	75		
Environmental NGOs	4	2	1	25		
Secondary User Group (n=178)	*120*	*29*	*58*	*88*		
Education Faculty Students	20	17	—	—	A faculty hall	Group-administered
School Officials	6	5	1	2	A school classroom	
School Teachers	20	17	11	19		
Education Faculty Lecturers	5	4	3	5	A hotel room	
Media Correspondents	3	3	1	2		
Imams (Religious Leaders)	14	12	—	—	Mosques and houses	Face-to-face
Food/Good Suppliers	14	12	19	33	Different outdoor places	
Handymen	6	5	10	17		
Housewives	32	27	13	22	Houses	

Within the 72 indicators, 43 were informed by the literature review: these are shown in Chapter 3. The remaining 29 indicators were informed by the community survey: of these indicators 7related to community awareness, 18 related to satisfaction and 4 related to preferences in relation to the MPA management. These are outlined in Chapters 4, 5 and6, respectively.

2.3 Data analysis

2.3.1 Survey questions

Descriptive analyses were undertaken to explore responses for the survey questions. The Fisher's Exact Test for two-way contingency tables was used to test significance of differences in responses (in terms of proportion of respondents who chose or listed selected answers) within the four key community groups:

a) *Socotran Decision Maker Group*;
b) *Socotran Primary User Group*;
c) *Socotran Secondary User Group*; and
d) *Yemeni Non-Socotran Secondary User Group*.

Fisher's Exact Test was also used to test for significant differences in responses within the three key Socotran groups (groups a–c), and between the *Socotran Secondary User Group* (group c) and *Yemeni Non-Socotran Secondary User Group* (group d). The Kruskal-Wallis (*H*) test was used to test significance of differences in responses (scores) within the four key stakeholder groups (groups a–d) and the three key Socotran stakeholder groups (groups a–c). The Mann-Whitney (*Z*) test was applied for testing these differences between the *Socotran Secondary User Group* (group c) and *Yemeni Non-Socotran Secondary User Group* (group d). The Statistical Package for the Social Sciences (SPSS) 20 was applied for these tests.

2.3.2 Management effectiveness

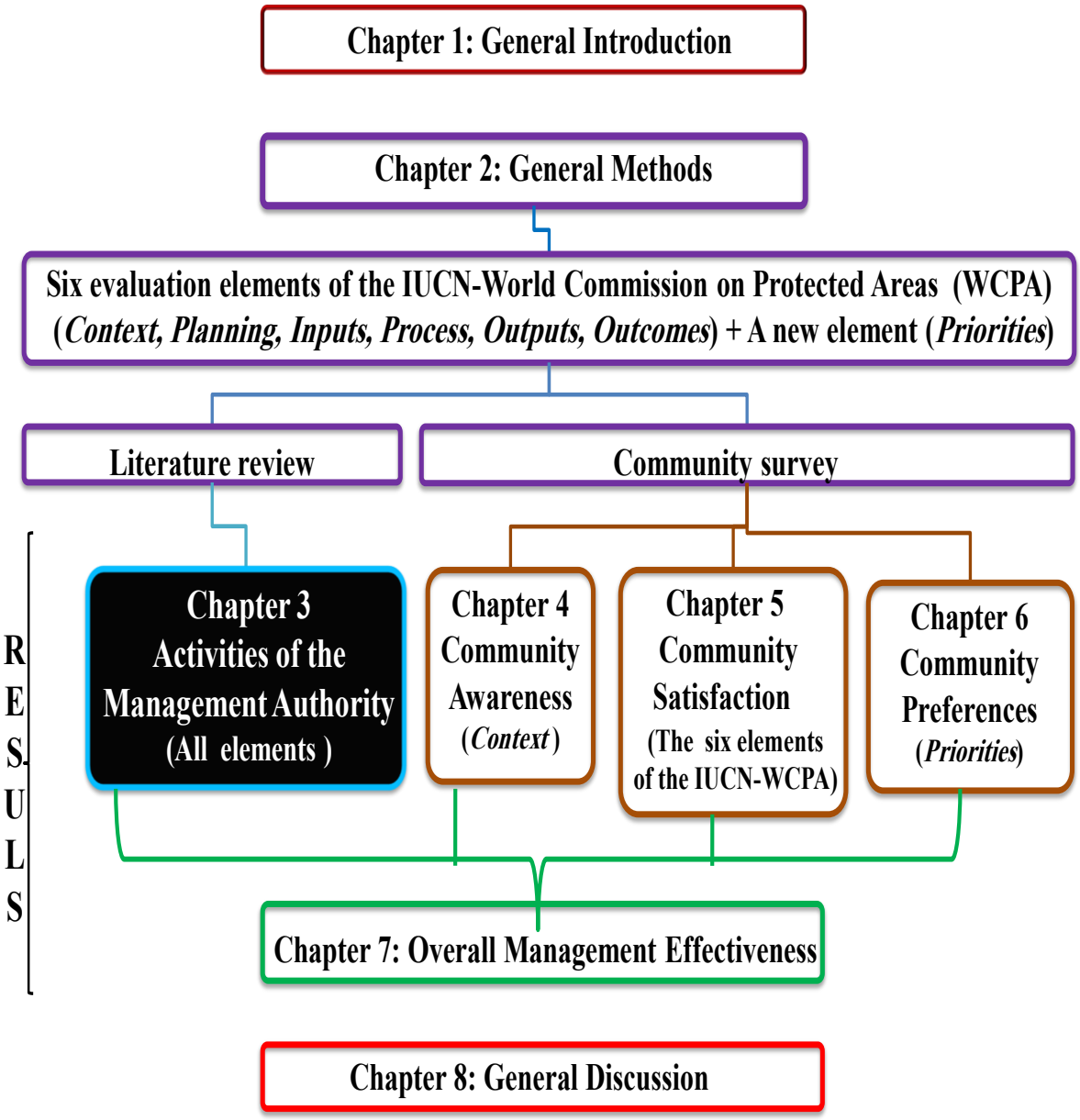
Each indicator used in my PhD study was scored 0 (Low), 1 (Moderate), 2 (High) or 3 (Very High) using the scoring system of the *WB Scorecard Tool* (Staub and Hatziolos, 2004) to assess the management effectiveness of the MPA (see Tables 3.2, 4.1, 5.1 and 6.1 in Chapters 3, 4, 5 and 6 respectively for examples). The Final Score was calculated to assess the management effectiveness based on the literature review (Chapter 3), community survey (Chapters 4, 5 and 6) and altogether (Chapter 7). The Final Score result of the management effectiveness of the MPA is the percentage of total scores obtained over the maximum score of indicators. This maximum score is the total number of indicators used multiplied by the maximum score of an indicator (3). For example, the maximum score of the 43 indicators used to assess the management effectiveness, via the literature review in this thesis, is 129 (i.e. 43 x 3). If the total scores for these indicators were 70, the Final Score would be as follows:

Final Score = (Total scores obtained/ Maximum scores of indicators) x 100.

Final Score = (70/ (129)) x 100 = 54%.

The Final Score result for effectiveness was ranked as Low (0%–25%), Moderate (>25%–50%), High (>50%–75%), or Very High (>75%). Ranks of Low and Moderate indicate inadequate effectiveness while High and Very High indicate effective management of the MPA.

Chapter 3: Activities of the Management Authority for the Socotra Island Marine Protected Area Management



3.1 Abstract

Assessments of the effectiveness of MPAs are important because many MPAs are failing to meet their management objectives. While several approaches have been used for assessing management effectiveness, there is no internationally accepted method for such assessment. The IUCN-WCPA Evaluation Framework includes criteria within six management elements (*Context, Planning, Inputs, Process, Outputs* and *Outcomes*). The *WB Scorecard Tool* is a common method used for assessing effectiveness of MPAs; it was developed based on the framework using a system for scoring indicators in a sheet form. I modified the above approach, allowing me to assess the management effectiveness of the Socotra Island MPA. I also developed indicators relating to an additional management element (*Priorities*). The assessment was based on reviewing available literature as well as a visit to the MA for up-to-date information and clarification. I found that the MA lacks some standard management tools, including an environmental management plan, to successfully manage the MPA. Overall, I assessed the effectiveness of the MPA management as inadequate. The mixed-approach method, which uses robust qualitative and quantitative data, with the additional developed management element (*Priorities*) provided a thorough understanding of how effectively the Socotra Island MPA is managed in terms of activities of the MA. There is a need for using additional approaches (such as community-based questionnaires) to assess management effectiveness of an MPA more comprehensively.

3.2 Introduction

The importance of assessing the effectiveness of MPA management was recognised in the 1990s (Hockings *et al.,* 2009), essentially because many MPAs failed to meet their biodiversity objectives (e.g. Burke *et al.,* 2011; Chapter 1). Then, during the 2000s there was an increased interest in using the MPA approach for conservation of marine biodiversity (Caveen *et al.*, 2013). However, many MPA managers failed to make appropriate decisions to conserve their marine biodiversity effectively (e.g. Hockings *et al.,* 2009). One key aspect

was that assessments of success were rare. It is now generally accepted that evaluation assessments of MPAs are valuable. As the risk associated with inadequate management of MPAs increases, then the importance of assessment grows as a means to inform appropriate decision making (e.g. Dahl-Tacconi, 2005) and thus increase management effectiveness. Assessments are valuable because understanding how effective their management was could overcome the problems that cause failure of MPAs and lead to improved conservation of their marine biodiversity. Therefore, there is a need for researchers to use an appropriate method to assess the management effectiveness of an MPA.

Management effectiveness is generally achieved by assessing a series of criteria (represented by carefully selected indicators) against agreed objectives or standards (Worboys, 2007; Hocking *et al*., 2006) and researchers have followed this concept to develop international assessment methods for MPAs since the 2000s. Several methods, including the *WB Scorecard Tool* (Staub and Hatziolos, 2004), have been developed to assess management effectiveness of MPAs based on the IUCN-WCPA Evaluation Framework (Hockings *et al.*, 2006; 2000), but there is no internationally accepted method for such assessment (Leverington *et al.*, 2010; 2008b; Chape *et al.*, 2005).

In the IUCN-WCPA Evaluation Framework, Hockings *et al.* (2006; 2000) assumed that a best practice protected area management should have six management elements (*Context, Planning, Inputs, Process, Outputs* and *Outcomes*). The assessment framework includes different criteria against these six management elements and different assessment methods for PAs, but it does not recommend specific methods (Leverington *et al.*, 2010; 2008b) for the MEE of PAs. As indicated in Chapter 1, the *WB Scorecard Tool* (Staub and Hatziolos, 2004) is applied in this thesis. This tool is the most appropriate and widely used method for assessing management effectiveness of MPAs (Van Lavieren and Klaus, 2013), but it is a rapid assessment method. Hence, there is no need for assessors/researchers to have detailed information in assessing management effectiveness of an MPA when using this tool (e.g. Leverington *et al.*, 2008b). Thus, I modified the tool for use in my PhD study to assess the management effectiveness of Socotra Island. Researchers (e.g. Dahl-Tacconi, 2007; 2005; Day *et al*., 2003) suggest different improved approaches for assessing management

effectiveness of an MPA. So, what are the appropriate approaches that can be used? This question is an obvious gap in the literature and needs to be addressed if we are to progress the MEE of MPAs.

I apply different approaches, including an additional management element (*Priorities*), and detailed information in this chapter to assess the management effectiveness of the Socotra Island MPA in terms of the activities of the MA. I develop indicators in relation to '*Priorities*' to investigate whether the MA set priority actions and implement appropriate strategic priorities for improving the MPA management. Using detailed information to assess the status and effectiveness of an MPA's management is a means for thorough understanding on how it is managed and whether its management scheme is effective. Sufficient data on the status of an MPA would improve the ability for assessment of management system effectiveness. However, worldwide the ability to assess the status and effectiveness of individual MPAs has been constrained by a lack of robust data (Wood *et al*., 2008). If researchers are to obtain detailed information for the assessment of the status and the MEE of an MPA, then they need to make efforts to thoroughly understand how well it is managed.

Consequently, in this chapter I use a mixed-approach method that combines detailed information (qualitative data) and a modified version of the scoring system (quantitative data) used in the *WB Scorecard Tool* (Staub and Hatziolos, 2004), including the additional developed management element (*Priorities*). In doing so I aim to investigate the validity of this mixed-approach method and whether there is a need for other approaches. It specifically aims to answer the questions outlined below.

3.3 Aims

This chapter addresses the first research question of my PhD thesis "*How effective is the Socotra Island MPA management in terms of management activities of the Management Authority (MA)?*" Specifically, it aims to answer the following questions:

- Which elements of management relating to the MPA are the most adequate?
- Which criteria of management relating to the MPA are adequate and inadequate?
- What is the status of the MPA management?

3.4 Methods

To assess the management effectiveness of the MPA the following steps were taken:

1. I collected all available literature to understand the status of the MPA;
2. I visited the Socotra Island MA on Socotra Island to collect further, up-to-date information;
3. I approached the most appropriate MA staff to affirm information and data collected;
4. I created an adjusted version of the criteria and the scoring system used by the *WB Scorecard Tool* (Staub and Hatziolos, 2004) to suit the situation;
5. I added criteria in relation to a newly developed management element, '*Priorities*', to the adjusted version of the *WB Scorecard Tool* (Staub and Hatziolos, 2004); and
6. I assessed the management effectiveness via updated literature/information according to the adjusted scorecard using indicators as shown in the following two sections.

3.4.1 Management status

Detailed information on the status of the Socotra Island MPA management and the types of activities undertaken by the MA were compiled from the literature available during my study. This literature included: governmental documents, mainly *Presidential Decree No. 275 for 2000* concerning Conservation Zoning Plan (CZP) of Socotra; other plans, particularly Socotra Archipelago Management Plan (SAMP); project reports on the Socotra Conservation and Development Program (SCDP) I, II and III; the terminal evaluation report on SCDP III (2003-2008); and relevant published papers, such as Van Damme and Banfield (2011), Elie (2009) and DeVantier (2004). I also visited the office of the MA (Yemeni EPA) on Socotra Island between April and May 2011 to collect up-to-date information in relation to the MPA. I approached the most appropriate staff members of the MA during this visit for clarification on some information regarding the MPA management.

The information on the status of the MPA used in this chapter was related to criteria addressed in the six management elements (*Context, Planning, Inputs, Process, Outputs* and *Outcomes*) of the IUCN-WCPA Evaluation Framework (Hockings *et al*., 2006; 2000) (see

Section 1.3.4.2, Chapter 1) and the additional management element '*Priorities*' I developed in this thesis (see Section 1.3.6.4, Chapter 1). Some aspects included different criteria in relation to more than one management element. For example, a legal framework—as an aspect—included criteria of legal status, legislation and enforcement in relation to '*Context*', '*Planning*' and '*Process*', respectively. Management improvement was an aspect within '*Priorities*' with different criteria, such as priority setting. The detailed data on the status of the MPA were used to assess the management effectiveness of the MPA through using the *WB Scorecard Tool* (Staub and Hatziolos, 2004) that is explained below in more detail.

3.4.2 Scoring system

The *WB Scorecard Tool* (Staub and Hatziolos, 2004) includes an assessment form that uses a system for scoring indicators. This form had 34 criteria represented by questions (for example "*Does the MPA have a legal status?*") as indicators to be answered with one of four possible responses (see Section 3.4.3), which enables a rapid assessment. It is simple to implement and it allows comparisons with data from other sites. The assessment form relies largely on available data (through literature searches) and on the informed opinions of site managers and/or independent management assessors (Van Lavieren and Klaus, 2013). It serves as a user-friendly reporting tool on MPA status that can be applied within a short period of time and at low cost (Leverington *et al.,* 2008b).

In this chapter, I slightly modified the assessment form of the *WB Scorecard Tool* (Staub and Hatziolos, 2004) in terms of indicators and score calculation to evaluate the management effectiveness of the Socotra Island MPA. Staub and Hatziolos (2004) point out that other indicators could be added to the form of this *WB Scorecard Tool* to suit a particular MPA situation and the accuracy of its scoring system might be improved by weighting the various scores. I used the indicators, including key and supplementary indicators, addressed in the form of the *WB Scorecard Tool*, and additional indicators – such as in relation to economic benefits –adapted from the *WB/WWF Management Effectiveness Tracking Tool (METT)* (Stolton *et al*., 2007**)** against criteria (Table 3.1). Table 3.1 provides an example for using an indicator for a criterion. Indicators in relation to responses of stakeholders (satisfaction and awareness), used in the assessment form of the *WB Scorecard Tool* were not used in this

study because they were not related to activities of the MA. I also developed three indicators against three new criteria (Table 3.1) in relation to the additional management element '*Priorities*' proposed in this case study to understand the appropriateness of the sustainability of the MPA management. These indicators were "*Is there consideration for reviewing and setting strategic priorities needed for improving the MPA management?*', "*Are stakeholders involved in reviewing and setting strategic priorities needed for improving the MPA management?*" and " *Are set strategic priorities implemented?",* which were used against management priorities review, stakeholders involvement in review and priorities implementation respectively. Each criterion used in my assessment, including the new criteria, was applied through using an indicator with a scoring system (Appendix C).

Each key indicator I used in my assessment has the same score scale (0–3), as opposed to the assessment form of the *WB Scorecard Tool* that has a score scale from 0 to 2 for some indicators and (0-3) for others. I believe that each key indicator has the same importance in the assessment, so the indicators should be on the same scale (0-3).

The final assessment form used in this chapter had 43 key criteria, represented by indicators/questions (Appendix C), and 27 additional criteria used as supplementary indicators for assessment of the management effectiveness of the MPA as shown in Table 3.1. Four, five, seven, ten, eight, six and three key indicators were applied for *'Context'* '*Planning*', *'Inputs'*, *'Process'*, *'Outputs'*, *'Outcomes'* and *'Priorities'* respectively.

Table 3.1 Criteria for assessing management effectiveness of the Socotra Island MPA in terms of activities of the MA.

Management elements	Key criteria	Supplementary criteria
Context	1. Identification of management objectives 2. Stakeholder participation* 3. Integration of the MPA into a coastal zone management plan (CZMP) 4. Legal status	1. Identification of priority threats 2. The MPA is part of a network of MPAs 3. Recognition level of the MPA 4. Community representation
Planning	5. Agreement on management objectives 6. Availability and implementation of a Management Plan (MP) 7. Regular work plans*** 8. Availability of legislations 9. Functions of the MPA design***	5. Availability of a long term master plan 6. Influence of stakeholders on the MP 7. Consideration of socioeconomic impacts 8. Consideration of local culture 9. Integration of MP into CZMP 10. Review of MP 11. Incorporation of study results into planning 12. Linking of MP to development
Inputs	10. MA facilities/equipment 11. Resources inventory** 12. Staff number 13. Local staff* 14. Training for staff 15. Sufficiency of budget 16. Security of budget	13. Studies on sustainable use level 14. Voluntary support
Process	17. Education and awareness 18. Communication 19. Stakeholder meaningful involvement 20. Inputs of local/native community 21. Maintenance of equipment 22. Protection system 23. Management of budget*** 24. Monitoring and evaluation 25. Research/surveys 26. Enforcement of legislation	15. Support of community 16. Open and trusting communication 17. Contribution of tourism operators ** 18. Emergency response capability
Outputs	27. Visitor interpretation signage** 28. Moorings 29. Education and awareness materials 30. Involvement mechanism for stakeholders 31. Education development for stakeholders	19. Multidisciplinary courses* 20. Wide distribution of several materials* 21. Tourism marketing*

Continued Table 3.1

Management elements	Key criteria	Supplementary criteria
Outputs	32. Management activities improvement 33. Visitors facilities 34. Staff capacity	
Outcomes	35. Management objectives 36. Values status 37. Threats status 38. Resources conditions 39. Community welfare 40. Economic benefits**	22. Compatibility of MPA management with local culture 23. Reduction of resource use conflicts 24. Equal benefits 25. Benefits maintained or enhanced
Priorities*	41. Management priorities review 42. Stakeholders involvement in review 43. Priorities implementation	26. Priorities enhance resource protection and community welfare 27. Stakeholders representation

* Developed in this thesis; ** Modified from the *WB Scorecard Tool* (Staub and Hatziolos, 2004); *** Adapted from the *WB/WWF METT* (Stolton *et al*., 2007).

3.4.3 Data Analysis

The scoring system of the *WB Scorecard Tool* (Staub and Hatziolos, 2004) was used to score each indicator either as 0 (Low), 1 (Moderate), 2 (High), or 3 (Very High). Table 3.2 shows an example of an indicator to assess its effectiveness level. An additional score (+1) was accrued for an applicable supplementary indicator.

The Final Score result (percentage) of the management effectiveness of the MPA follows the same equation as shown in Section 2.3.2, Chapter 2:

Final Score = (Total scores obtained/ Maximum scores for indicators) x 100.

In this chapter, the maximum scores of the management effectiveness are obtained by multiplying 43(all key indicators) by 3 (the maximum score for each key indicator) plus an additional point for each applicable supplementary indicator. For instance, if two supplementary indicators were applicable to the MPA, the maximum score of the management effectiveness would be 131(43 x 3 + 2). This calculation was also used for effectiveness of each of the seven management elements (*Context, Planning, Inputs, Process, Outputs, Outcomes* and *Priorities*) addressed in this chapter. For example, in this chapter,

'*Context*' had four key indicators plus four supplementary indicators, so the maximum score of these indicators would be 12 (4 x 3) + a score (s) for applicable supplementary indicators. Therefore, if one supplementary indicator were applicable, the maximum score of this element would be 13 (100%). The Final Score for the management effectiveness of each element was either ranked as Low (0%–25%), Moderate (>25%–50%), High (>50%–75%) or Very High (>75%). Ranks of Low and Moderate were assessed as inadequate for managing the MPA while High and Very High were adequate.

Table 3.2 An example of the scoring system for an indicator used to assess the management effectiveness of the Socotra Island MPA in terms of activities of the MA.

Criteria: Legal status ***Indicator: *Does the MPA have a legal status*?**	**Scores**
The MPA is not gazetted.	0
The government has agreed that the MPA should be gazetted but the process has not yet begun.	1
The MPA is in the process of being gazetted but the process is still incomplete.	2
The MPA has been legally gazetted (or in the case of private reserves is owned by a trust or similar).	3

*Adapted from the *WB Scorecard Tool* (Staub and Hatziolos, 2004)

3.5 Results

The MA lacks some standard management tools, including an environmental management plan, to successfully manage the Socotra Island MPA. The Final Score (37%) of the management effectiveness of the MPA was ranked as Moderate, meaning that its management was inadequate. Detailed information on the MPA management status (qualitative data) and results of the assessment of the MPA *Scorecard* (quantitative data) are provided in the following sections.

3.5.1 Management status

This section provides detailed information on the status of the Socotra Island MPA management within thirteen different aspects in relation to the criteria of six management elements of the IUCN-WCPA Evaluation Framework and the additional developed management element '*Priorities*'.

3.5.1.1 Management Objectives

The management objectives of the Socotra Island MPA were identified in the CZP as:

1. Protect the biodiversity of Socotra islands.
2. Achieve a balance between the population needs in development and the available natural resources such that they are not negatively impacted.
3. Preserve the traditional practices in management of natural resources.
4. Protect the nature sanctuaries of national and international importance in Socotra islands.
5. Protect the genetic material of rare and endemic species in Socotra islands.
6. Exercise a sound environmental management in these areas to protect natural resources from negative impact of development activities.

The above six CZP objectives are general. However, the CZP has four key zones (Resource Use Reserve, Natural Sanctuary, National Park and General Use). The whole of Socotra's marine area is protected and zoned into one of these four zones (see Appendix A). Each of the four zones has its own specific objectives addressed in the CZP.

3.5.1.2 Legal framework and MPA design

Legal Status

The MPA was established in1996 (Gladstone *et al.*, 2003; 1999; PERSGA/GEF, 1998) and its CZP was legally declared in 2000 by a Yemeni *Presidential Decree No. 275 of 2000*. The CZP assigns all coastal areas to one of four conservation categories that are in increasing order of protection (Republic of Yemen, 2006), and is the basis for conservation and management of the environment of Socotra Island.

Legislation

There are three Yemeni laws concerning the marine environment. The two key ones are the *Environmental Protection Law No.2 of 1995* and *Fisheries Law No. 2 of 2006*. The legal basis for the CZP can be found in the first law, which is the legal framework for the

establishment of PAs and their administration in Yemen. In light of this law, the CZP gives the Yemeni EPA/Ministry of Water and Environment (MOWE) the legal authority to administer to the environment of Socotra Island. The second law was developed and amended in 2006 to contain other articles concerned with management and penalties on illegal fisheries. It gives the Ministry of Fish Wealth (MFW) the legal authority to regulate fisheries. The two laws cover different issues in relation to living marine resources. These include harvesting of sea turtles that nest on beaches of Socotra Island. The MA, which is the EPA Office in Socotra, developed a local by-law regulation with the local council authority to administer fines of Yemeni Riyals (YRs) 50,000 (~US$250) for killing a turtle and YR 10,000 (~US$50) for removing their eggs. The latter fine is considered high for such an activity in Yemen. The third law is the *Protection of the Marine Environment from Pollution Law No. 16 of 2004*, authorised by the Maritime Affairs Authority. It is concerned with navigation of vessels, oil spills and compensations for coral damage by vessel groundings. Therefore, there are three different governmental bodies that have three different laws relating to the conservation of the marine environment and resources of Socotra Island.

3.5.1.3 Plans

Management Plans

A Master Plan for 10 years (2001–2010) was prepared for Socotra Island in 2000 dealing with development of four main sectors: Fisheries, Economic Development, Local Authority and Health. The purpose of this Plan was to achieve the Yemeni government's principal goal of an environmentally sound development plan for the Socotra Archipelago with specific objectives addressed for each sector (Republic of Yemen, 2000). The Master Plan was endorsed in 2004 by the Yemeni *Cabinet Decree No. 47* (e.g. Republic of Yemen, 2006), but has not yet been implemented for financial reasons.

There is no environmental management plan for the Socotra Island MPA, but there is a five-year SAMP (2003–2008) and Fisheries Management Plan (FMP) for this Archipelago, including the MPA. The SAMP is available from the web site of the UNESCO World Heritage within the nomination proposal file submitted by the Yemeni Government to the UNESCO in 2006 for inscription of Socotra Island in the World Heritage Lists. The SAMP

included components of capacity building, education and awareness, and community support. The SAMP was mainly developed based on a document for a project (SCDP III)) (Republic of Yemen, 2003). This project was implemented from 2003 to 2008. The FMP was developed in 2000 (Nichols, 2001) and reviewed at two meetings with several stakeholders, including representatives of government officers, fisher cooperative societies, and marine environmental extension officers (Esseen and Al-Saqaf, 2002; Hariri, 2002). The FMP was endorsed at a meeting by these stakeholders (Hariri, 2002), but it is not yet implemented or endorsed by the Yemeni Government.

There are three zone-specific environmental management plans for three Marine Park Zones (MPZs) – DiHamri, DiTwah and Rosh (Gawler and Mashhour, 2009; Republic of Yemen, 2006). These plans aim to enhance the management in relation to the specific objectives of this zoning category addressed in the CZP. The plans have been implemented except for the DiTwah MPZ due to land ownership conflicts with the nearby local community (Gawler and Mashhour, 2009).

Work Plans

Work plans are outlines of management activities needed to be finished within a specified time frame. Generally, Yemeni governmental authorities prepare work plans to be implemented in one year. However, the MA did not have such plans for the Socotra Island MPA management. Their main activities have been based on activities of outside projects, relying on them to develop and implement annual work plans.

3.5.1.4 MPA staff

The MA has only a few staff with specialised training in the marine environment. Prior to 2009 it had over 80 staff members, supported by five staff members in Sana'a, the capital of Yemen (Republic of Yemen, 2006), but most worked on projects external to SCDP. There were 17 technical and management staff on Socotra Island, with extension officers, meteorologists and support staff (Republic of Yemen, 2006). In 2012 there were 36 staff members working for the MA on the island. Four were marine technical staff. Almost all of the officers from 2009, as contracted persons recruited by SCDP III (2003–2008), were no

longer working at the MA. Most staff members are Socotrans, but they are not all marine technical specialists or have significant management roles for the MPA, though there is a capacity program for them provided by SCDP III. This program included training courses on SCUBA diving, environment impact assessment, fisheries stock assessment, reef check (monitoring), and geographic information systems (Gawler and Mashhour, 2009; Yemeni EPA, 2008; 2007; 2004). Importantly, two of the Yemeni non-Socotran staff members were supported to do doctoral and master's degrees in relation to the marine environment in Italy and Britain, respectively, but one of them is no longer working for the MA.

3.5.1.5 Local community involvement

Local communities had participated in several activities – such as cleanup campaigns – within activities of outside projects, particularly for the SCDPs. In 2006, over 1600 students from 16 schools and over 200 women participated in public awareness on the protection of the marine environment of Socotra Island (Yemeni EPA, 2007). According to the Republic of Yemen (2006), people from local communities, mainly Socotrans, also actively participated in several biodiversity monitoring programs, including sea turtle monitoring and tagging and monitoring of fishing efforts, conducted by the MA.

The MA had several meetings on the management of the MPA with diverse local community groups within activities of outside projects. For example, the MA had regular meetings during SCDP I, II and III (1997–2008) directly with heads of villages, local council officials, and fishery society officers in relation to the CZP (Klaus *et. al*., 2003), fisheries management plan (Esseen and Al-Saqaf, 2002; Hariri, 2002) and two-specific management plans for two zones, DiHamri and Rosh (Yemeni EPA, 2004), within the MPA. In 2011, the MA held a meeting within the activities of a recent outside project (Socotra Governance and Biodiversity Program (SGBP)), with diverse stakeholders, in relation to establishment of a new independent authority for the MPA. However, local women did not widely participate in the activities of SCDP III (2003–2008) (Gawler and Mashhour, 2009), which is probably due to local traditional customs.

3.5.1.6 Financial resources

The MPA had been supported with outside projects financed by international donors and certain governments, with contributions from the Yemeni Government, since 1997. Between 1997 and 2001, US$5million came from the Global Environment Fund (GEF) and UN Development Program (UNDP) for the outside project of SCDP I. In 2001–2003 (SCDP II) US$1,350,000 came from the Netherlands government and UNDP. For the SCDP III (2003–2008), US$5.5 million came from the Yemeni Government, Italy and the UNDP (Republic of Yemen, 2006). Lastly, for the period 2010–2013 (SGBP), US$2.7 million came from the Yemeni Government, GEF and UNDP. The contribution of the Yemeni Government for the projects has increased from less than US$360 in 1997 (Republic of Yemen, 2006) to US$270,000 in 2010 for the SGBP. However, much less than half of the total funding was allocated for activities in relation to the MPA. In addition, the Yemeni Government has allocated less than YRs 600,000 (~ US$3000) for the annual operational budget for the MA on Socotra Island since 2001.

The French Government also supported the MPA in 2010, granting US$300,000 for establishing a new authority to enhance the management of the Socotra Island PA, including the MPA, within the SGBP project. Specifically, it was then expected that the French Friends Funds contribute with US$1.5 million for marine conservation of Socotra Island. However, this project stopped in June 2011 as a consequence of the political instability in Yemen.

It was proposed that entry fees for non-resident visitors of Socotra Island would be levied in 2009 according to the Yemeni *Cabinet Decree No. 49 of 2008*, but this did not happen. However, there is an entry fee for visiting DiHamri MPZ. The fee is administered by a community-based society and used to maintain facilities of this zone.

3.5.1.7 Facilities and equipment

MA facilities

The MA has an office base in Hadibo, the capital of Socotra Archipelago, with some equipment such as computers, email connection, diving equipment, various research

equipment, library, communication equipment and seven four-wheel-drive vehicles. It represents the best-equipped and staffed government entity on the island, with the exception of the Departments of Health, Education and Agriculture (Republic of Yemen, 2006). The MA lacks a comprehensive library and a research boat, and most of their equipment, including diving gear and cars, lacks maintenance due to the insufficient budget. They are usually maintained only when funds are available from outside projects.

Visitor Facilities

Visitor facilities available on Socotra Island include hotels and tourist camps, but they are still under the standard needs for visitors. In 2012, there were four hotels, with a total of 58 rooms, operating on the island. Although three main hotels have their own generators, they do not offer 24-hour electricity that cuts off for hours daily. They do not have Internet and it is not possible to make local or international phone calls from them. Such utilities are only available in the central market of the Socotra Island capital. The available restaurants, with the exception of one hotel, offer basic local cuisine (Republic of Yemen, 2006). The tourist camps have been constructed in the MPZs of DiHamri, DiTwah and Rosh. They include a camping area, parking, toilets, kitchen and shaded eating areas. There are available local ecotourism guides, including divers who accompany groups of tourists. However, most hotels lack satisfactory facilities for visitors, and the camps are available only in a few marine zones with ample infrastructure (personal observation, 2011).

Patrolling System

Fishing control on Socotra Island is difficult due to deficiencies in the patrolling system of the local authorities (Van Damme and Banfield, 2011).The coastguards existing on Socotra Island are responsible for patrolling of illegal fishing and vessel navigation, but their capacity is very weak due to a lack of a large modern vessel with surveillance devices, and adequate staff numbers. Local fishers operate without fishing licenses or registration. Further, large foreign fishing vessels arrive during the southeast monsoon season, when domestic fleets cannot operate, and poaching in Socotran seawaters is common because of limited patrolling and enforcement (Nichols, 2001).

3.5.1.8 Awareness and education

The MA conducted an awareness-raising and education program in relation to the marine environment for local communities during the SCDPs (Gawler and Mashhour, 2009). It aimed to: 1) raise public awareness on the importance of marine resources and impacts of threats and factors, such as marine overexploitation and coral collection, affecting the marine environment; and 2) build capacity of local communities in relevant areas to conserve marine living resources of the MPA. The MA organised different awareness-raising workshops about the MPA, which a wide range of local community groups, including council members, governmental officials, village heads, fishery societies, students and housewives participated in. The MA provided training for community leaders, hotel personnel and tourism police officers on management and service provision for ecotourism. Importantly, 17 local persons from different coastal villages were trained to be marine environmental extension officers. They were trained to explain the purpose and importance of the MPA, including the role of the marine environment and biodiversity protection in local communities. In these ways, the officers were important for maintaining close links between the MA and communities. However, according to the assessment of the SCDP III, which was undertaken by Gawler and Mashhour (2009), there is a need to further increase the awareness and education program, though this project fully achieved its goals (Gawler and Mashhour, 2009).

Awareness materials, such as leaflets and posters, were widely distributed during the 2001–2008 SCDP, but not all of these products were related to the marine environment of the MPA. For example, 1300 copies of tourism maps and 500 copies of leaflets on Socotra Island, including the marine environment, were distributed in 2007 (Yemeni EPA, 2007), as well as two videos and poster cards about Socotra Island. Two hundred copies of leaflets on the DiHamri MPZ were distributed in 2007 (Yemeni EPA, 2007). However, the number and types of awareness materials, including posters and leaflets, on the marine environment and diversity of the MPA was limited because the projects did not focus on production of such materials. In fact, I found that the production of the awareness materials has been significantly reduced since 2009 for financial reasons.

3.5.1.9 Signs

I found the MPA lacks visitor interpretation signage and mooring buoys for MPA boundaries as output products. The three MPZs (DiHamri, DiTwah and Rosh) had signage boards installed with their zone names (personal observations, 2011). However, no visitor interpretation signage on their zoning categories, about other marine zones, or on the CZP is installed. No mooring buoys were installed to show the snorkeling or diving sites within the MPA.

3.5.1.10 Research and monitoring

Extensive scientific research on the MPA was undertaken through the SCDP I (1997-2000) (e.g. Apel *et al.*, 2002). Several resource inventories, including fish and underwater habitats, marine turtle nesting, fishing and meteorology were conducted during this project (e.g. Republic of Yemen, 2006). Mapping and descriptions were also completed for bird populations, meteorological conditions, marine biodiversity, subtidal and tidal habitats, fishing activities, turtle nesting and vegetation by plots, transects and key species. The SCDP I supported the most extensive research activities conducted so far on Socotra Island and adjacent waters (Republic of Yemen, 2006). In 2010, an agreement between the German Senckenberg Institute and the MA was reached to conduct research on fish communities.

The MA implemented separate regular biophysical monitoring programs for the MPA, particularly during the SCDP III (2003–2008). Monitoring programs for sea turtles, coral reefs (e.g. DeVantier, 2004), fish assemblages, lobsters and seawater temperature (Yemeni EPA, 2007) were implemented during this project period. In 2008, reef check surveys on coral reef communities in Socotra Island were also undertaken within the regional monitoring program of the Red Sea and Gulf of Aden (PERSGA, 2009). Since 2010, there has been an ad-hoc monitoring program, particularly for fish communities, conducted by the German Senckenberg Institute in collaboration with the MA. Implementation of the monitoring programs has mainly relied on projects funded by foreign governments and donors. In addition, no regular socioeconomic monitoring has been implemented by the MA or included in the SCDPs.

3.5.1.11 Marine environment status

Different threats (human activities, natural disturbances and contamination) could affect the marine ecosystem and biodiversity of the MPA. Human activities include local overfishing and international illegal trawling (Van Damme and Banfield, 2011; Cheung and DeVantier, 2006). Killing of sea turtles and the ongoing collection of sea cucumbers (PERSGA, 2008) and shark fins are other examples of unsustainable resource uses of the marine ecosystems of the MPA (Van Damme and Banfield, 2011), leading to degradation of the biodiversity. Natural disturbances occurring on Socotra Island through shoreline alteration attributed to erosion and the 2004 Indonesian tsunami may have also affected marine ecosystems of the MPA (Van Damme and Banfield, 2011). There were significant effects of bleaching events on coral reefs of Socotra Island in 1998 (e.g. Abdulaziz *et al.*, 2005). The contamination and waste accumulation in lagoons of Socotra Island could be important disturbances leading to a reduction in biodiversity (Van Damme and Banfield, 2011).

Some human activities may interact with natural disturbances to increase the impact to the marine environment of the MPA. For example, collection of coral and stones for building and liming in Socotra Island (Cheung and DeVantier, 2006; Morris, 2002) and a larger-scale development of channels for a large harbour planned for construction on its northern coast changed beach profiles and altered the morphology of the shoreline, respectively (Van Damme and Banfield, 2011). The decline in mangroves and increased coastal infrastructure on the northern coast of Socotra Island also changed the beach profile (Van Damme and Banfield, 2011). Additionally, Abdulaziz *et al.* (2005) found a major decline in hard coral cover at a shallow site at the Socotra Island seaport between 2001 and 2002. They concluded that it was probably attributable to the combined impact of elevated sea surface temperature and changes in water quality due to anthropogenic pollution resulting from development activities taking place within the port and the newly constructed road.

3.5.1.12 MPA impacts on the local community and stakeholders

The criteria in relation to community welfare and economic benefits delivered to a local community are used as indicators for management effectiveness of MPAs in the *WB*

Scorecard Tool (Staub and Hatziolos, 2004) and *WB/WWF METT* (Stolton *et al.,* 2007), respectively. Information on these criteria in relation to the MPA is provided in this section.

The lifestyle of the local community on Socotra Island has noticeably changed since unification of Yemen in 1990 (Republic of Yemen, 2006). The Yemeni Government delivered main public services and facilities on the Island. These include electricity, water supplies, a hospital, schools, airport and roads. Socotrans mainly earn a living via fishing, herding livestock, date cultivation and gathering plant product, although more recently (in the last ten years) several have taken positions in governmental offices and in tourism sectors on the Island. The tourism sector is growing as an employment opportunity and Yemenis from other areas have come to work in this sector, contributing to the rising income of Socotrans. With the exception of Socotrans directly working in this sector, the local community hardly benefits directly from it (personal observation, 2011). As a major component of the lifestyle of the local community and of Socotra Island's biodiversity riches, marine ecosystems are very important in Socotra Island (Van Damme and Banfield, 2011).

I found that the Socotran community welfare and economic development have not noticeably improved since official declaration of the MPA in 2000. There is only a small jetty and no natural port or sewerage facilities available on the Island. Limited solid waste management systems are in place. Electricity is available for some hours only in the two towns (Hadibo and Qualansya). The majority of the Socotran population is considered to live below the absolute poverty line due to insufficient provision of basic human needs, such as access to sustainable livelihoods, safe water, health services and education (Gawler and Mashhour, 2009). No industry or large-scale manufacturing exists on the Island. With the exception of dried fish, very little is being exported from Socotra Island. Local economic development opportunities based on fishery and eco-tourism in Socotra Island is lost, under-exploited or exploited in a way that is not environmentally sustainable (Republic of Yemen, 2003). The potential future development of the fishery sector in Socotra Island is limited (Klaus *et al.,* 2002). The eco-tourism sector could be an opportunity for development of community welfare and economics of Socotra Island (e.g. Republic of Yemen, 2006; Klaus *et al.*, 2002).

Investors have a great interest in eco-tourism development, including marine eco-tourism, on Socotra Island (Republic of Yemen, 2006). The Yemeni General Tourism Development Authority (GTDA) appears to promote the Island as a resort destination to potential investors. However, the coordination of the GTDA with the other major related agencies (the MA and the Yemen Tourism Promotion Board) for this purpose is very low. This uncoordinated approach has led to some concern on the Island about the possibility of it being developed as a mass tourism destination to the detriment of its unique environment and social structures with no eco-tourism strategic plan for Socotra Island (Republic of Yemen, 2006). Relevant plans, including eco-tourism and marketing plans, to release such economic benefits to communities on the Island, have not yet been developed.

3.5.1.13 Management improvement

Since 2006, the MA has proposed two major activities to improve management of the MPA. These activities are: 1) developing and implementing local by-law regulations for conservation of the marine turtles, and 2) developing an institutional framework for a proposed new independent authority, which is called the Socotra Development Authority (SDA). This authority was proposed to be responsible for management and sustainable development of the Socotra Archipelago, including the MPA (IUCN, 2008), but the SDA has not yet been established.

The MA has set a few priority actions (conservation of marine turtles, lobsters, and traditional fisheries practices) for improving the MPA management with Socotra Island decision makers, particularly local council members and village heads. Conservation of marine turtles, as an example, was first undertaken by the MA, but this was then incorporated with local communities. The MA helped in establishment of a community-based organisation aiming to conserve marine biodiversity of the MPA, which was considered as a priority action needed to improve the MPA management.

There was no adequate review for setting priority actions for improvement of economic and social issues. For example, the study of tourism capacity or development of a management plan for the Socotra Island MPA was not set as a priority. Some of the priority initiatives

were not implemented, such as conflict resolutions for the zone-specific management plan of the DiTwah MPZ, which is also inscribed within international coastal wetland sites of the Ramsar Convention on Wetlands. This MPZ is the only Ramsar site in Yemen so far (http://www.ramsar.org/wetland/yemen).

3.5.2 Management effectiveness

3.5.2.1 Overall management

The Final Score obtained for the management effectiveness of the Socotra Island MPA was 37%. Overall, based on the broad assessment ranking categories (Low, Moderate, High and Very High), this Final Score was ranked as "Moderate", meaning that the management of the MPA was inadequate in terms of activities of the MA.

The scores for the seven management elements assessed for the management effectiveness of the MPA, in terms of activities of the MA, varied and no element scored over 50% (ranked High) except for *'Context'* (Figure 3.1). These scores ranged from 22% to 62%, which were recorded for *'Outcomes'* and *'Context'*, respectively. Given the ranking categories used in this chapter, each management element was assessed as inadequate for the MPA management except for *'Context'* that was assessed as adequate.

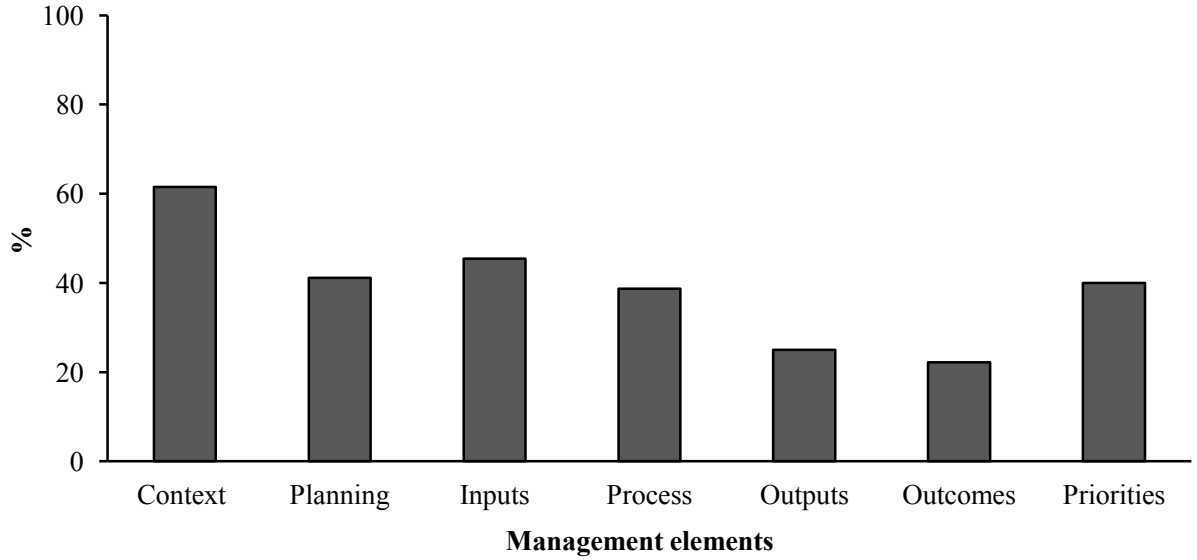


Figure 3.1 The effectiveness scores, as percentages, obtained for each of the seven management elements assessed for the management effectiveness of the Socotra Island MPA in terms of activities of the MA.

3.5.2.2 Scores of indicators

Scores of the 43 key indicators varied and no indicator scored 3 (ranked Very High) with the exception for one indicator (MPA gazettal) in relation to '*Context'* (Table 3.3). Most indicators (n=33) scored 1 (ranked Moderate) and only five scored 0 (ranked Low). In contrast, four key indicators scored 2 (ranked High). Scores of the indicators in relation to '*Context'* scored from 1to 3, whereas those were in relation to '*Planning*', '*Outcomes*' and '*Process'* scored from 0 to 2, 0 to 1, and 1 to 2, respectively. The indicators related to '*Priorities'* all scored 1. No indicator in relation to '*Outcomes*' or '*Priorities*' scored higher than a 1. Therefore, only five indicators were assessed as adequate, whereas the remaining indicators (n = 38) scored inadequate for managing the MPA in terms of activities conducted by the MA for this area. Table 3.3 shows the score result for each indicator, which is based on information provided in Section 3.5 and the scoring system used in Appendix C. For example, the indicator of "identification of management objectives" received a score of only 1 because the management objectives of the MPA were general (not specific) as shown in Section 3.5.1.1. For this indicator to obtain a score of 3 the management objectives needed to be related to all values of the MPA, including biological and socio-cultural economic values.

Table 3.3 Scores of indicators used to assess the management effectiveness of the Socotra Island MPA in terms of activities of the MA.

Elements	Aspects	Criteria/Indicators	Scores
Context	Management objectives	Identification of management objectives	1
	Legal framework and MPA design	Existence of legal status (MPA Gazettal)	3
		Integration of MPA into CZMP	1
		The MPA is internationally recognised	+1
	Local community involvement	Community participation in activities	2
Planning	Management objectives	Agreement on management objectives	1
	Legal framework and MPA design	Function of the MPA design	1
		Availability of legislation	2
		The MPA is part of an MPAs network	+1
	Plans	Management plan	0
		Regular work plan	1
		Availability of a long-term master plan	+1
Inputs	MA staff	Staff number	1
		Local staff	1
		Training for staff	1
	Financial resources	Budget allocation	1
		Budget security	1
		Outside financial support	+1
	Facilities and equipment	MA facilities	1
	Research and monitoring	Resource inventory	2
Process	Legal framework and MPA design	Legislation enforcement	1
	Local community involvement	Stakeholder involvement	1
		Community inputs in decision making	1
		Communication with local community	1
		Support of local community	+1
	Financial resources	Budget management	1
	Facilities and equipment	Maintenance of equipment	1
		Patrolling system	1
	Education and awareness	Education/awareness programs	1
	Research and monitoring	Research and survey programs	1
		Monitoring and evaluation programs	1
Outputs	Local community involvement	Stakeholder involvement mechanism	1
	MA staff	Staff capacity	1
	Facilities and equipment	Visitor facilities	1
	Education and awareness	Education development for stakeholders	1
		Education and awareness materials	1
	Signs	Visitor interpretation signage	0
		Moorings	0
	Management improvement	Management activities improvement	1
Outcomes	Marine environment status	Addressing of management objectives	1
		Values status	1
		Threats status	0

Continued Table 3.3

Elements	Aspects	Criteria/Indicators	Scores
Outcomes	Marine environment status	Resource condition	0
	Impact on community	Welfare of local community	1
		Economic benefits to local community	1
Priorities	Local community involvement	Stakeholder involvement in setting priorities	1
	Marine environment status	Priorities enhancing resource conservation	+1
	Management improvement	Management priorities setting and review	1
		Management priorities implementation	1

Scores: 0=Low; 1=Moderate, 2=High; 3= Very High; "+" indicates additional points for supplementary indicators applicable to the MPA management and considered in the scoring system.

3.6 Discussion

3.6.1 Overall discussion

The assessment of this case study (using the modified *WB Scorecard Tool*) revealed that there is inadequacy in management of the MPA. The Final Score (37%) of the management effectiveness of the MPA was ranked as Moderate. This suggests that the MA had some difficulties in managing the MPA effectively.

Insufficient financial resources are one likely obstacle contributing significantly to the inadequacy of the MPA management. Indeed, Ferraro (2009) and Hockings *et al.* (2009) have indicated that insufficient financial resources are the single most significant obstacle to PA management. The MA has an annual operation budget of ~US$3000 for managing the terrestrial and marine PAs on Socotra Island, which is not sufficient for minimum needs, such as surveys, for the MPA management. Such a finding is similar for MPAs in Kenya, which experience financial obstacles due to their insufficient budget allocation, though revenues are collected for them (Muthiga, 2009).

The government's vision and inappropriate management practices are other likely contributors to the inadequacy of the MPA. An environmental management plan is an indicator of a government level of commitment to actively manage a PA (Van Lavieren and Klaus, 2013), but the MPA here lacks such a plan. Instead, the MA initiated zone-specific

management plans for two Marine Parks (DiHamri and Rosh) as pilot zones. However, this approach is unlikely to be an appropriate management practice because the MPA have other important zones (Natural Sanctuaries) that lack such a plan. This leads to failure in meeting the management objectives addressed in the MPA's CZP. This study revealed that the development and implementation of an environmental management plan or other plans, such as a tourism development plan, for the whole MPA were not set within the Yemeni government's vision to manage the MPA effectively. Instead, the government seeks to establish a new independent MPA as a future strategy expecting to improve the MPA management.

The inadequacy of the MPA management is not uncommon. Similar inadequacies were found in MPAs assessed for their management effectiveness in neighbouring countries (Bahrain, Emirates, Kuwait, Iran, Qatar, Oman and Saudi Arabia) (Van Lavieren and Klaus, 2013) and MPAs of Sri Lanka (Perera and de Vos, 2007).

A noteworthy finding from this assessment is that the '*Context'* element was the only management element assessed as adequate (ranked High), compared with the other remaining elements (*Planning, Process, Inputs, Outputs, Outcomes* and *Priorities*), which were inadequate (ranked Moderate or Low). In relation to '*Context*' the Yemeni government played a dominant role in developing the MPA gazettal (ranked Very High) with legal declaration, involving diverse stakeholders in relation to the CZP (ranked High). The government also played an international role in inscribing the MPA within the UNESCO Man and Biosphere Reserves in 2003 and as a Natural World Heritage Site in 2008, which was a supplementary indicator obtained for '*Context*'. In contrast, most of the indicators within the other management elements were inadequate, mainly due to inadequacies in financial resources plus weakness of the institutional framework as discussed below.

3.6.2 Criteria assessing: inadequate

The MPA has major inadequacies (ranked Low) for criteria within three management elements: lack of a management plan (*Planning*); visitor interpretation signage and moorings (*Outputs*); and increase in threats status and effects on resource conditions (*Outcomes*). These criteria of management are discussed below, followed by those ranked Moderate.

3.6.2.1 Criteria assessing: inadequate (ranked Low)

The Yemeni government does not have an environmental management plan for the MPA (ranked Low), which is common for MPAs in developing countries. For example, Van Lavieren and Klaus (2013) revealed that 20 of the 22 MPAs assessed from the neighbouring governments lack management plans. The MA developed management plans for the three MPZs (DiHamri, DiTwah and Rosh) during the SCDP III (2003–2008) rather than developing a management plan for the whole MPA with all zones. The lack of an environmental management plan for the MPA is likely to contribute to its poor planning, even though the MPA has a CZP and three zone-specific management plans.

The lack of a management plan can cause political problems for an MPA (Thomas and Middleton, 2003; Young and Young, 1993) as happened between the MA and Socotra's Office of MFW for the fishery management. To date, the Office of MFW has not endorsed the FMP by the Yemeni Government as indicated in Section 3.5.1.3. My study revealed that the MA lacks power or cooperation in managing fisheries with the MFW and there are problems related to marine resources exploitation, particularly for the sea cucumber fishery, between these two entities.

Although the MPA has a CZP, it does not have any mooring buoys (ranked Low) as output products to demarcate snorkeling and diving sites. Salm *et al.* (2000) highlight the use of the mooring buoys to demarcate such sites to prevent damage from anchors. Such buoys are not available in the MPA, though tourists visit it. Although installing mooring buoys is logistically difficult, and they are expensive and challenging to maintain, their installation is important to mitigate damage to valuable coral reefs of the MPA, which will help conserve marine biodiversity, one of the objectives listed in the MPA's CZP.

The MPA lacks visitor interpretation signage (ranked Low), which could contribute to failure in conserving marine biodiversity conservation. Sign boards above water are often essential to indicate assets such as turtle nesting beaches, vulnerable sand dunes, dangerous marshes, bird nesting or roosting colonies, to which the public would normally have ready access (Salm *et al*., 2000). Visitors and local people may need to be aware of the importance and/or activity restrictions in relation to each zoning category of the MPA. This information can be

provided to visitors through interpretation signage for conservation of marine resources. The MPA includes accessible sensitive beaches, but it does not have such signage. Lack of interpretation signage likely contributes to difficulties in controlling marine resources, leading to poor management processes of the MPA.

The apparent inadequacy of the MPA enforcement, including inadequate surveillance and patrolling of offshore trawlers (ranked Low), relating to '*Process*' is not just common for this MPA only. Such an inadequacy is common in other MPAs in both developing and developed countries (Evans and Russ, 2004; McClanahan, 1999). For example, Van Lavieren and Klaus (2013) report that almost all of the 22 MPAs they studied in developing countries had constraints in enforcement of legislation and surveillance systems. Davis *et al.* (2004) revealed that there was inadequate surveillance and enforcement on offshore trawlers operating in the Great Barrier Reef Marine Park of Australia, particularly in the first decade or so after initial zoning of this Park.

3.6.2.2 Criteria assessing: inadequate (ranked Moderate)

The MA appears to have difficulties in meeting management objectives '*Outcomes*' (ranked Moderate) of the MP specified in the CZP in relation to the marine biodiversity conservation due to the increase in threats (ranked Low). Such threats include illegal international trawling (Van Damme and Banfield, 2011; Abdulaziz *et al*., 2005; Nichols, 2001), local overfishing (Van Damme and Banfield, 2011), drilling of a sea port and coastal roads (Abdulaziz *et al*., 2005), and alteration of physical beach profiles through logging of mangroves (Van Damme and Banfield, 2011). Overfishing in the MPA has increased due to the breakdown of the Socotran fishing practices that were previously regulated by traditional laws based on lower fishing efforts (Van Damme and Banfield, 2011). The international demands for Socotran sea products, especially shark fins and sea cucumbers, as well as illegal fishing by industrial trawlers have increased this problem (Cheung and DeVantier, 2006). The decline in the coral reefs through construction of the sea ports and new coastal roads (Abdulaziz *et al.*, 2005) and an increase in the removal of mangroves (Van Damme and Banfield, 2011) would suggest that the current condition of natural resources within the MPA are not the same compared with their state before the establishment (ranked Low). Difficulties in conservation of the

marine diversity of the MPA will continue as long as illegal activities continue, such as trawling, and many regulations are not enforced as discussed below.

The staff working for the MPA is assessed as inadequate (ranked Moderate). Having only four technical marine staff (ranked Moderate) working for the MPA on Socotra Island is unlikely to be adequate to manage the MPA with a size of 3625km²and 25 zones with four different zoning categories. The professional capacity of the MA staff (ranked Moderate) is well below the minimum required to perform their mandate effectively. This fact is widely recognised in all recent government and donor assessments (Republic of Yemen, 2006).

The MPA has inadequacy in the annual operational budget (~US$3000) allocated to the MA for its management (ranked Moderate) because this amount is not sufficient even for basic needs of its management. There is also inadequacy in security of such financial resources (ranked Moderate). Although there is a system developed to obtain fees from non-Socotrans this does not happen.

The environmental awareness program of marine resource conditions, threats and management activities for the MPA (*Process*)has significantly declined since 2009, which was assessed as inadequate (ranked Moderate). Although the MPA had several outside projects, particularly SCDP, running such a program, they were not specifically focused on the marine environment. Additionally, the absence of almost all marine extension officers since 2009 and inadequate awareness materials reduces effectiveness of the raising awareness program for the local community (*Process*). Communication (*Process*) of the MA with the local community (ranked Moderate) via these officers no longer exists because the SCDP ended in 2008 and almost all associated officers have stopped working for the MA. The environmental awareness-raising program is conducted only when there are projects or activities funded by outside resources.

I also found inadequate community involvement in decision making (ranked Moderate) in relation to the management of the MPA, though a wide range of stakeholders (including local governmental authorities and Socotrans) were involved in development of the CZP. Although the MA involved the related stakeholders for decision making for the management of the

MPA, there is no mechanism for community involvement. Poor coordination and disagreements between the MA and other related authorities for fisheries management and tourism development indicated this fact.

The assessment in this chapter suggests that Socotra Island had inadequate visitor facilities (ranked Moderate), which could lead to future management challenges for the MPA because there is increased interest by Socotrans in tourism development. Many researchers have indicated that unregulated tourism impact can be substantial and may represent a severe threat to the overall marine biodiversity (e.g. Milazzo *et al.*, 2002). The MPA is a multi-use category and Davis and Tisdell (1995) urge that management challenges between tourism and conservation may occur in such MPAs. They highlight the need for studies on biology and social carrying capacities in multi-use MPAs to formulate suitable management responses to reduced MPA values, as recommended by Republic of Yemen (2006) for this MPA.

The MPA has not yet had an actual impact on the local community since declaration of its legal status in 2000 because social and economic services, including public services, are inadequate. As far as I know the MPA has not had any significant negative impact on lives of these people since then. The Yemeni Government has not further developed Socotra Island since 2000. Public services, community welfare, livelihoods and standards of living were ranked Moderate because they were still the same as in 2000.

My assessment results suggest that most of the local community has not yet gained direct benefits from the marine resources of the MPA since declaration of its legal status in 2000 (ranked Moderate) because the tourism sector is not yet active. Tourism is potentially a significant economic source for the Island and there is increased interest to develop it. However, there is no progress in this regard, including no development of a tourism strategy, because there is disagreement and low coordination between the MA with other related government stakeholders to activate this sector. In addition, the recent instability of the country has deterred investors from tourism. Some Socotrans benefit from Yemeni visitors and tourists (5000/year) visiting Socotra Island. Direct benefits from the MPA for the local community were only considered to be from tourists and visitors visiting the active two

marine park zones (DiHamri and Rosh) that are operated by Socotrans living adjacent to them.

Inadequacies of the management aspects relating to the MA staff numbers, staff capacity, visitor facilities, awareness and education, communication and involvement of community groups in the decision-making processes for management, were also not uncommon results. Van Lavieren and Klaus (2013) investigated such inadequacies in over half of the 22 MPAs assessed for their management effectiveness in the neighbouring countries and similarly found in MPAs of Sri Lanka (Perera and de Vos, 2007).

3.6.3 Criteria assessing: adequate

The gazette was the only adequate aspect (ranked Very High) assessed for effectiveness of the MPA management, suggesting that the MPA has a strong legal status. Although there are other national PAs in Yemen, the Socotra Island MPA is the only Yemeni MPA that has been gazetted by a presidential decree so far. Not many MPAs, particularly in developing countries, have such an authority. For example, Van Lavieren and Klaus (2013) report that most of 107 MPAs have been 'Proposed' but not actually gazetted in the neighbouring developing countries.

I assessed stakeholder participation as adequate (ranked High) because progress reports of the outside projects indicated that many people from the local community participated in several varied activities, such as beach cleanup campaigns, in relation to the management of the MPA. Such participation is not uncommon for GEF-funded projects that usually place emphasis on participation of people in their activities, especially when MPAs are internationally significant as is the case with the Socotra Island MPA. However, effective participation of the local community in MPA management-related activities was undertaken only when there were outside projects occurring.

I also assessed the legislation for managing the MPA as being adequate (ranked High) because several laws exist for the marine environment of Socotra Island. No additional legislation is required for conservation of the environment of Socotra Island because

sufficient legal powers exist in the Environmental Protection Law and there is a Presidential Decree declaring the Island to be a special PA (Republic of Yemen, 2006). However, IUCN (2008) have highlighted the need to strengthen the legislation for Socotra Island, including the MPA. They indicated that the legislation should include development of by-laws to back up the CZP and review the boundaries of the existing zones that have been assessed as inadequate (ranked Moderate) for their functions. These legislations are currently under consideration for development.

According to my data, the MPA has an adequate availability of baseline data and inventories on marine resources (ranked High), which is not common for MPAs in developing countries. Many MPAs worldwide do not have adequate data (Peckett *et al.,* 2014), though establishment of MPAs is usually based on resource inventories. However, further studies, including tourism capacity, and inventories on sea cucumber species are still required to improve the MPA.

Community support (*Process*) and setting priorities enhancing marine natural resource conservation (*Priorities*), such as a new by-law against turtle killing, for the MPA were supplementary management criteria considered in my assessment. These were not unexpected because Socotra Island is believed to have been occupied by Socotrans for at least two millennia (e.g. Elie, 2009) and they have relied on natural resources, including fish, for their income and living. Such support and conservation initiatives are not common in many MPAs, especially in the Arabia region, with Socotra Island having unique cultural and ecological values.

3.6.4 Implications of the approach

The mixed-approach method used in this study provided a rich understanding of how effectively the MPA is managed. Although this approach has strengths, it has challenges also, as described here.

3.6.4.1 Strengths and Challenges

Overall, the mixed-approach method (both qualitative and quantitative) used in this chapter provided a useful assessment of how a specific MPA is managed and provided insights into

whether this management is perceived to be sufficiently effective. Taking time and visiting the MPA for detailed data collection allowed me to thoroughly understand the status of the MPA activities (qualitative data). These detailed data allowed me to assess the management effectiveness using the scoring system (quantitative data) of the MPA in detail rather than doing the assessment only with a rapid literature based search over a short period. The additional element '*Priorities*' I developed, to assess whether the MA had made actions and progress towards status of the MPA, was effective in that it showed availability and appropriateness levels of these activities for improving the MPA management.

Challenges for the assessment in this chapter included the fact that collecting detailed and consistent information was time consuming and visiting the MA for this purpose was costly. Assessment of several MPAs with this approach would need a relatively large budget. Therefore, I suggest researchers use available information where possible and supplement it with communication with managers. This approach was used by Van Lavieren and Klaus (2013) for many MPAs in neighbouring countries to Socotra Island.

Another challenge was in scoring some indicators in the assessment form of the *WB Scorecard Tool* (Staub and Hatziolos, 2004) for assessing the management effectiveness of the MPA. These indicators were addressed as two-part questions such as "*Does the MPA have monitoring and evaluation?"* This would be a major challenge when a MPA has monitoring but it does not have evaluation, so this question should be divided in two separate questions: "*Does the MPA have monitoring?"* and *"Does the MPA have evaluation?*".

3.6.4.2 Further studies

I suggest a further study for the *WB Scorecard Tool* (Staub and Hatziolos, 2004) in order to increase confidence in the assessment of effectiveness because of the challenges in scoring compound indicators in the assessment form. The two-part questions used as indicators could be divided into two separate questions, seeing as such two-part questions have uncertainty in research (see Neuman, 2007). Questions should be specific and clear. Hence, it may be worth revising and developing the *WB Scorecard Tool* (Staub and Hatziolos, 2004).

Although the mixed-approach methods used was able to provide a comprehensive assessment for management effectiveness of the MPA system, there is a need to incorporate the impact

of the MPA management on the local community as an additional main approach for a comprehensive evaluation process. Understanding the status of the MPA and assessment of activities of the MA are not sufficient approaches for assessment of MPA management effectiveness, though detailed information were available. Such approaches are not adequate to show the impact of the MPA management on local communities. Community viewpoints have been used in the evaluation of the effectiveness of MPAs (e.g. Heck *et al.*, 2012; Himes, 2007; Dahl-Tacconi, 2005). Hockings *et al*. (2006) argue that effectiveness assessments of PAs, including MPAs, should consider involving local communities in the evaluation process (see Chapter 1).

3.7 Concluding remarks

The method I used in this chapter provided baseline information and understanding on how an MPA is managed and whether it follows standard procedures for management. It is particularly successful when it is combined with a concerted effort to apply the findings of the evaluation and to strengthen the management of the MPA to acceptable levels. However, there is a need to develop other approaches, such as a community survey, to assess the effectiveness of the MPA management more comprehensively. Results in this chapter support the concept addressed in the literature on using a combination of different approaches for the MEE of an MPA.

The results of this chapter on the management effectiveness of the MPA indicate that:

- The Yemeni government played a significant role in developing the legal status and international significance of the MPA; and
- The MPA had largely been supported with outside projects.

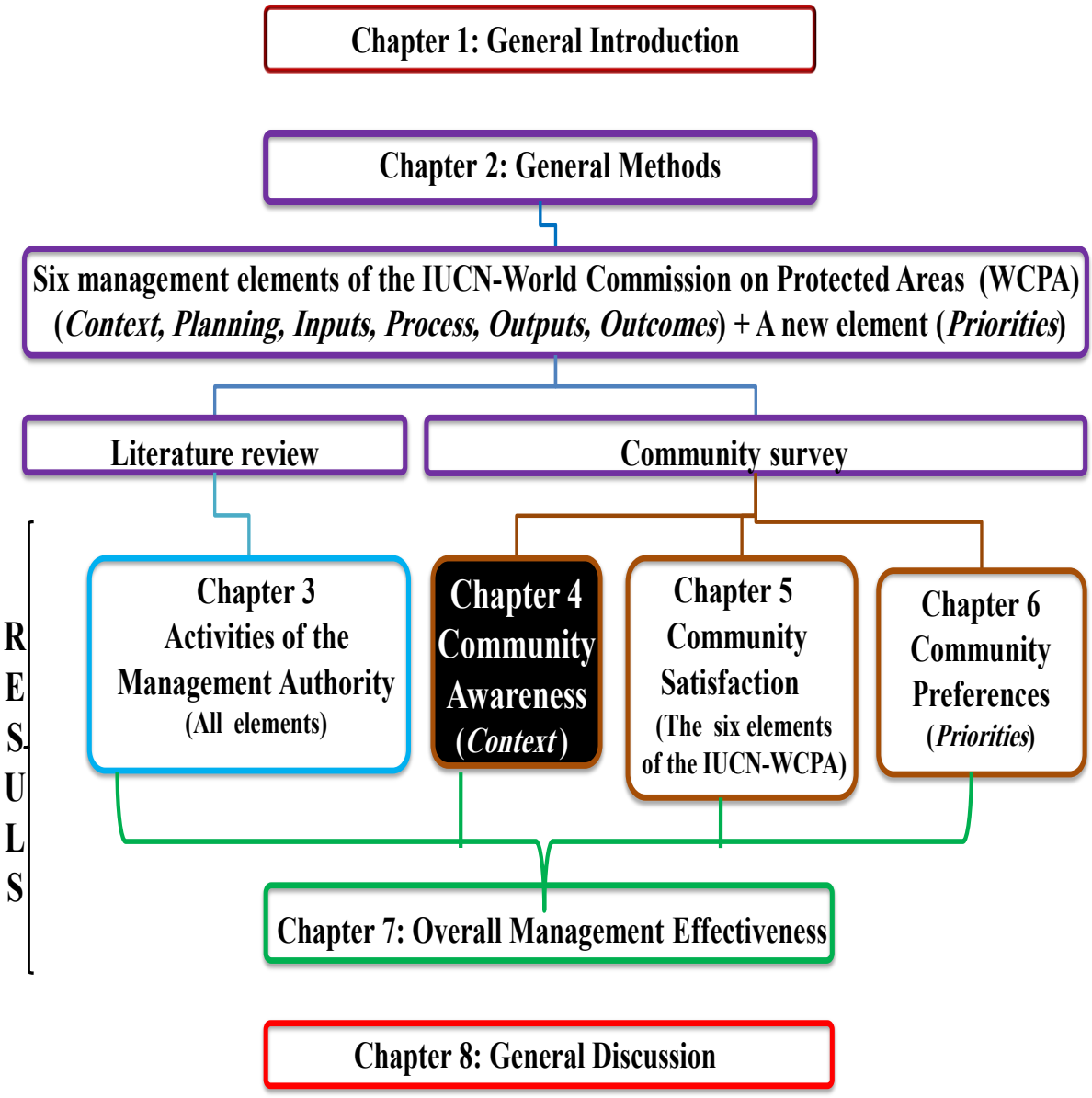
However:

- The MPA management is beyond the current capacity of the MA;

- The MPA still lacks essential standards and tools required – including a management plan–for its effective management, although it has a few very effective management criteria;
- The MPA does not have noticeable products, particularly signage, for the CZP;
- The MA had difficulties in controlling threats affecting the MPA, thus the MPA did not meet its conservation objectives as specified in the CZP; and
- Insufficient funding, weakness of institutional capacity and inadequacy of enforcement, with the large size of the MPA, leads to management difficulties.

If the Yemeni government is to improve the management of the Socotra Island MPA, it is important to allocate and secure sufficient financial resources and strengthen the institutional framework to manage it more effectively. Development and implementation of a management plan – as a major management process standard – is highly recommended for the MPA. Based on the results and recommendations I provided in this chapter, managers could develop and implement actions to improve the MPA management. This, in turn, could lead to increased effectiveness of the MPA management, thus achieving its objectives, including marine biodiversity conservation, successfully.

Chapter 4: Community Awareness of the Socotra Island Marine Protected Area Management



4.1 Abstract

Governments may fail to achieve management objectives of MPAs if local community awareness of MPA objectives and/or stakeholder participation in management-related activities is low. Levels of community awareness can be used as a measure to assess the management effectiveness of an MPA, but there is no known approach that comprehensively includes several indicators relating to awareness for this assessment. In this chapter, I develop and use a scoring system to analyse management effectiveness of the Socotra Island MPA in terms of community awareness and participation. To do this I created seven indicators based on the results of a survey of 23 local community subgroups of Socotrans and Yemeni Non-Socotrans. Overall, I found the management effectiveness of the MPA was low; the local community had a low awareness of the MPA and stakeholder participation in the management-related activities was limited. Creating several specific indicators from the survey and considering the views of various stakeholders allowed a thorough understanding of how effectively the MPA is managed and levels of community awareness and participation in relation to management of the MPA. This approach provides a comprehensive means to assess the effectiveness of management for the Socotra Island MPA using two broad social criteria, thus allowing governments to review current practices and improve management outcomes of an MPA.

4.2 Introduction

Considering communities perceptions towards and awareness of MPAs is well recognised as being an important component of management (Charles and Wilson, 2009; Dimech *et al.*, 2009; Jones *et al.*, 2004; Bunce *et al.*, 1999). Indeed many researchers point out that an MPA could fail due to lack of local peoples' knowledge of its management (e.g. Himes, 2007; Hockings *et al.*, 2006). This is important because how communities perceive the effectiveness of MPAs is fundamental for the social acceptance of these areas (Leleu *et al.*, 2012). Vodouhê *et al.* (2010) suggest that understanding perceptions of local residents could help managers involve people more effectively and improve their awareness about marine

biodiversity conservation within PAs, including terrestrial and marine PAs. Understanding what people perceive about the management of an MPA can lead managers to improve support for important management-related decisions.

Community awareness of an MPA is measured and included in tools that are used for the MEE of MPAs. However, the challenge is that there is no standard method that considers diverse community subgroups' awareness of various criteria to allow an evaluation. Although the *WB Scorecard Tool* (Staub and Hatziolos, 2004), is a common method used internationally and it assesses the community's awareness of an MPA in relation to its management, such an approach could be considered superficial because the tool only includes one criterion (Threat) as an indicator of community awareness of MPAs. By using several criteria in relation to such awareness could provide managers and assessors with a clearer picture regarding the effectiveness of awareness-raising programs undertaken for MPAs.

In addition, Hockings *et al.* (2006) highlight the importance of involving stakeholders, including local communities, in the management effectiveness assessment of PAs, including MPAs. Yet, the *WB Scorecard Tool* (Staub and Hatziolos, 2004) does not highlight awareness across diverse stakeholders in the assessment. Involving diverse community subgroups in the assessment method could help researchers understand the awareness level of each stakeholder in regards to MPA management, thus investigating how effective are the awareness-raising programs conducted by management authorities.

Assessing awareness of diverse local community subgroups using multiple management criteria, and community groups' participation levels relating to the MPA management, is an approach I used in this chapter in relation to the element of '*Context*'. This element is one of the six management elements of the International Union for Conservation of Nature (IUCN)-World Commission on Protected Areas (WCPA) Evaluation Framework (Hockings *et al*., 2006; 2000) assessed for the management effectiveness of protected areas, including MPAs (see Chapter 1). '*Context*' relates to criteria such as the legal status of MPAs and the community's awareness and participation in relation to management of these areas. The

approach used in this chapter aims to: assess the effectiveness of the management of the MPA in relation to this element by understanding the community's awareness of various management criteria; understanding the level of community participation in MPA management-related activities; and exploring its validity as a contribution to the literature.

4.3 Aims

This chapter addresses the second research question of this thesis "*To what extent is the local community aware of different management criteria relating to Socotra Island MPA and to what extent does the community participate in MPA management-related activities*". It aims to answer the following key questions:

- Is the local community aware of the geographical scope; the primary management objectives; the rationale behind the establishment; the type of zoning categories; the most ecological important marine values; and priority threats in relation to the MPA?
- Are there differences in community groups' awareness of the pertinent criteria mentioned in the previous key question?
- To what extent does the local community participate in activities relating to the MPA management?
- How effective is the management of the Socotra Island MPA in terms of local community awareness of the different criteria relating to the MPA management, and community participation in management-related activities?

4.4 Methods

4.4.1 Data collection

4.4.1.1 Survey questions

Seven questions from the community survey, including open and closed-ended questions as outlined below, explored the awareness and participation levels of local community members living on Socotra Island in relation to the MPA management. This survey was based on a

questionnaire and respondents were identified within 23 community subgroups which included Socotrans (n=414) and Yemeni Non-Socotrans (n=66) at the beginning of interviews (see Chapter 2). Responses to the open-ended questions were sorted into descriptive categories using inductive analysis (Patton, 2008).

The rationale and coding of the seven survey questions were as follows:

1. *"To what extent do you think that the waters surrounding Socotra Island is a marine protected area?"* This was a closed question to detect the local community members' awareness of how much of the coast of Socotra Island is a PA. Respondents were asked to choose one option: Don't know; 1%–25%; 26%–50%; 51%–75%; 76%–99% or 100% of waters surrounding Socotra Island, scored from1 to 6 respectively for statistical analysis. Note, the whole coast of the Island is a PA according to the MPA's CZP.

2. *"What do you think are the primary objectives of marine protected zones of Socotra Island"?* This was an open-ended question, later compared to the actual objectives of the MPA, to determine whether the local community members understand the scope of the management objectives of the MPA addressed in the CZP.

3. *"In your opinion, what was the rationale behind management of the marine protected zones of Socotra Island"?* This was an open-ended question to determine whether the local community members are aware that conservation of marine biodiversity, as determined by the Yemeni government, was the main rationale behind the establishment of the MPA. If respondents mentioned more than one rationale, they were asked to choose one main rationale. For those who completed the survey via group-administered interviews (see Chapter 2) and listed more than one rationale, the first written rationale was considered in the analysis.

4. *"The marine environment of Socotra Island has important values. What are these values in your opinion?"* This was an open-ended question to determine the level of community members' awareness about the most important marine value to the MPA (marine biodiversity) as documented in the literature (e.g. IUCN, 2008; Republic of Yemen, 2006). A simple definition of 'values' was provided next to the question.

5. *"In thinking about the threats affecting the marine environment of Socotra Island, in your opinion, what is the extent of effects of the following issues on this marine environment?*"This was a closed-ended question to understand the extent community members are aware of the three significant issues threatening values of the MPA as identified in the Socotra Archipelago Management Plan (SAMP) (invasive species, resource overexploitation and coastal development) and whether they perceive the other four issues (non-Socotran fishers, foreign trawlers, litter and collecting corals) reported in the literature (e.g. Van Damme and Banfield, 2011; Cheung and DeVantier, 2006; Nichols, 2001) as priority threats. Respondents were asked to choose one option on a 1–4 ranking scale (where 1 = High Threat, 2= Medium Threat, 3 = Low Threat and 4 = Not Threat). Respondents were also allowed to choose the option of "Don't know/no opinion. A simple definition of 'threats' was provided next to the question with a list of the seven issues.

6. *"What do you think are the categories of marine protected zones of Socotra Island?"*This was an open-ended question to investigate the extent of community members' awareness of the four main zoning categories listed in the MPA's CZP (See Appendix D). Responses were coded as: 'Correct' for knowing more than two of the zoning categories; 'Somewhat Correct' for knowing one or two zoning categories; 'Somewhat Incorrect' for mentioning at least one zoning category similar to (but not the same as) the zoning categories listed in the CZP; 'Incorrect' for not mentioning any correct or similar category to the zoning categories of the CZP; and 'Don't know'. Each of these scores was coded numerically, from 1 to 5, respectively, for statistical analysis.

7. *"Have you participated in any of the following activities in relation to management of the marine environment of Socotra Island?"* This was a multiple-choice question to determine the extent to which the local community members participated in activities relating to the MPA management. Respondents were asked *t*o choose one or more than one activity within four relevant activities listed to them: awareness-raising programs, training workshops, meetings and research/field works. The option of 'Other' was provided, in case they participated in other activities.

4.4.1.2 Effectiveness assessment

To assess the management effectiveness of the MPA based on community awareness and participation, results from the seven survey questions outlined above were each used as a collection of seven indicators. These seven indicators were provided as questions (see Appendix D). Community awareness of an MPA has been described in the *WB Scorecard Tool* (Staub and Hatziolos, 2004); however, these researchers used only one question as an indicator in relation to stakeholder awareness of resources conditions and threats. In contrast, I used six questions as indicators to show the level of community awareness and one question on the level of their participation within the MPA. Together, these indicators describe '*Context*' of the MPA management in this chapter.

4.4.2 Data analysis

4.4.2.1 Survey questions

Descriptive analyses were undertaken to explore responses for the above seven questions. As indicated in Section 2.3.1, Chapter 2, the Fisher's Exact Test for two-way contingency tables was used to test significance of differences in responses (in terms of proportion of respondents who chose or listed selected answers as shown in Table 4.1) within the 23 subgroups, which were included within the four key community groups (see Table 4.2 in this chapter):

a) *Socotran Decision Maker Group*;
b) *Socotran Primary User Group*;
c) *Socotran Secondary User Group*; and
d) *Yemeni Non-Socotran Secondary User Group*.

Fisher's Exact Test was also used to test for significant differences in responses within the above four key groups (a–d), three key Socotran groups (groups a–c) and between the *Socotran Secondary User Group* (group c) and *Yemeni Non-Socotran Secondary User Group* (group d). The Kruskal-Wallis (*H*) test was used to test significance of differences in responses (scores) within the four key groups (a–d) and the three key Socotran groups (a–c). The Mann-Whitney (*Z*) test was applied for testing these differences between the *Socotran*

Secondary User Group (group c) and *Yemeni Non-Socotran Secondary User Group* (group d).

4.4.2.2 Effectiveness assessment

Similar to the scoring system used by Staub and Hatziolos (2004) and in Chapter 3, responses to each of the seven questions – considered as indicators – were scored either 0 (Low), 1 (Moderate), 2 (High) or 3 (Very High) based on proportions of all respondents who were aware of each criterion and participated in MPA management related activities as shown in Appendix D. Table 4.1 shows an example for an indicator.

Table 4.1 An example of the scoring system for an indicator used to assess the management effectiveness of the Socotra Island MPA in terms of the community's awareness of the MPA (Survey Question 1: *"To what extent do you think that the waters surrounding Socotra Island is a marine protected area?"*).

Criteria: The geographical scope of the MPA **Indicator: *Is the local community aware of the correct geographical scope of the MPA?***	**Scores**
Less than 26% the local community is aware of the correct geographical scope of the MPA.	0
From 26% to 50% of the local community is aware of the correct geographical scope of the MPA.	1
From 51% to 75% of the local community is aware of the correct geographical scope of the MPA.	2
More than75% of the local community is aware of the correct geographical scope of the MPA.	3

The Final Score result of the management effectiveness of the MPA in relation to '*Context*' was calculated as a percentage following the same equation used in Chapter 3, which is indicated below:

Final Score = (Total score obtained/ Maximum scores of indicators) x 100.

The maximum score of the indicators relating to '*Context*' was 21, which was calculated by multiplying the total number of indicators (7) by the maximum scores for each indicator (3). The Final Score for effectiveness was categorised as either Low (0%–25%), Moderate (>25%–50%), High (>50%–75%), or Very High (>75%–100%). Ranks of Low and Moderate indicate inadequate effectiveness while High and Very High indicate effective management of the MPA in terms of community awareness and participation in relation to '*Context*'.

4.5 Results

4.5.1 Community awareness of the Socotra Island MPA

4.5.1.1 Awareness of the MPA geographical scope (Survey Question 1)

All respondents

Less than a quarter of all respondents (n= 480), Socotran (n= 414) or Yemeni Non-Socotran (n= 66) respondents from the local community were aware that the water surrounding the whole coast of Socotra Island is included in the MPA (Table 4.2). Almost half (46%) of Socotran respondents thought that no more than 25% of the waters surrounding the Island are zoned as an MPA.

Stakeholder groups/Community subgroups

Overall, no more than 25% of respondents from each key stakeholder group correctly stated the geographical scope of the MPA, indicating that their awareness of it was low. There was no statistically significant difference in the proportion of respondents who identified the geographical scope within the three key Socotran stakeholders groups (H= 0.068, p = 0.967). In contrast, more respondents from the *Socotran Secondary User Group* correctly stated the geographical scope of the MPA than those from the *Yemeni Non-Socotran Secondary User Group* (Z = -1.579, p = 0.001).

The 23 community subgroups awareness of the geographical scope of the MPA was very low. No more than 36% of respondents from a community subgroup identified the correct geographical scope of the MPA (Table 4.2). Out of the 23 community subgroups from the Socotran stakeholder groups, respondents from only 13 communities, including *Fishery Society Officials* and *Village Heads*, could correctly identify the geographical scope of the MPA. Out of the seven subgroups from the *Yemeni Non-Socotran Secondary User Group*, respondents from only four communities (*Education Faculty Lecturers*, *School Teachers*, *Food/Good Suppliers* and *Handymen*) correctly stated this scope.

Table 4.2 Awareness of respondents on the geographical scope of the Socotra Island MPA (Survey Question 1: *To what extend do you think that the waters surrounding Socotra Island is a marine protected area?*). 1 = Don't know; 2= 0–25%; 3= >25–50%; 4= >50–75%; 5 = >75% –99%; 6= 100%.

Respondents/Stakeholder groups/Community subgroups (n)	***Responses, % of respondents**					
	1	2	3	4	5	6
All Respondents (480)	2	42	20	12	6	18
All Socotrans (414)	1	46	19	11	6	17
All Yemeni Non-Socotrans (66)	3	22	29	17	9	20
***Socotran Decision Maker Group* (77)**	1	47	18	14	8	12
MA Staff (11)	0	36	18	18	18	10
Local Council Officials (12)	0	58	25	8	9	0
Fishery Society Officials (11)	0	46	0	0	18	36
Ministry of Fish Wealth Staff (5)	20	20	20	20	20	0
Related Governmental Officials (8)	0	62	38	0	0	0
Village Heads (18)	0	72	6	0	0	22
Coast Guards (3)	0	33	67	0	0	0
Tourism Police Officers (9)	22	0	0	0	78	0
***Socotran Primary User Group* (217)**	1	51	15	5	3	25
Fishers (170)	0	54	15	4	2	25
Harbour Officers (12)	0	58	17	0	0	25
Ex-Marine Extension Officers (11)	0	64	9	0	0	27
Tourism Guides (6)	0	17	33	33	0	17
Other Governmental Staff (14)	7	29	0	21	22	21
Environmental NGOs (4)	0	25	50	0	0	25
***Socotran Secondary User Group* (120)**	3	33	26	19	11	8
Imams (Religious Leaders)(14)	50	21	7	7	15	0
Education Faculty Students (20)	5	10	50	25	10	0
School Officials (6)	0	83	0	0	17	0
Education Faculty Lecturers (5)	0	80	20	0	0	0
School Teachers (20)	5	35	20	15	10	15
Media Correspondents (3)	0	33	0	67	0	0
Food/Good Suppliers (14)	0	43	22	14	14	7
Handymen (6)	0	67	17	0	0	16
Housewives (32)	6	16	25	31	16	6
***Yemeni Non-Socotran Secondary User Group* (58)**	4	23	29	17	10	17
School Officials (1)	0	0	100	0	0	0
Education Faculty Lecturers (3)	0	33	34	0	0	33
School Teachers (11)	18	18	27	27	0	10
Media Correspondents (1)	0	100	0	0	0	0
Food/Good Suppliers (19)	0	16	32	10	16	26
Handymen (10)	0	50	20	0	0	30
Housewives (13)	0	15	39	31	15	0

4.5.1.2 Awareness of the MPA management objectives (Survey Question 2)

All respondents

The respondents were not aware of all six management objectives addressed in the MPA's CZP (see Section 3.5.1.1, Chapter 3). These were: 1) achievement of a balance between population needs in development and available natural resources; 2) protection of genetic material of rare and endemic species; 3) protection of national and international nature sanctuaries; 4) marine biodiversity conservation; 5) protection from development activities and 6) traditional practices conservation. Overall, when respondents were asked what they thought were the primary objectives of the MPA it was expected that they would mention these six objectives, but no respondent listed any of the first three objectives. Respondents listed the other three objectives in some way, but no more than half of all respondents mentioned one objective (Figure 4.1). Less than 4% of respondents mentioned protection from development activities and traditional practices conservation. In contrast, 49% of all respondents listed marine biodiversity conservation. However, respondents listed an additional 10 categories, including fish/fisheries conservation, coral reefs conservation and marine environment protection (see Figure 4.1). They listed this additional category of fish/fisheries conservation more frequently than marine biodiversity conservation or any other primary objectives/additional categories.

Stakeholder groups

The four key stakeholder groups listed the three management objectives of the MPA included in the CZP's differently (Figure 4.1). All four groups listed marine biodiversity conservation much more frequently than the other two objectives listed in this CZP (protection from development activities and traditional practices conservation). No more than 7% of respondents from any key stakeholder group mentioned protection from development activities or traditional practices conservation. In contrast, more than 42% of respondents from each key stakeholder group mentioned marine biodiversity conservation.

Marine biodiversity conservation and the fish/fisheries conservation were the most frequently listed primary objectives by the *Yemeni Non-Socotran Secondary User Group* and the three

key Socotran stakeholder groups, respectively. However, there was no statistically significant difference in awareness of marine biodiversity conservation within these four key stakeholder groups, the three Socotran stakeholder groups, or between the *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group*. There was also no statistically significant difference in mentioning fisheries/fish conservation within the three key Socotran groups. In contrast, 58%, 61% and 43% of respondents from the *Socotran Decision Maker Group*, *Socotran Primary User Group* and *Socotran Secondary User Group*, respectively, mentioned this objective more frequently than those from the *Yemeni Non-Socotran Secondary User Group* (p = 0.006).These three key Socotran stakeholder groups thought that fish/fisheries conservation was the main primary objective of the MPA.

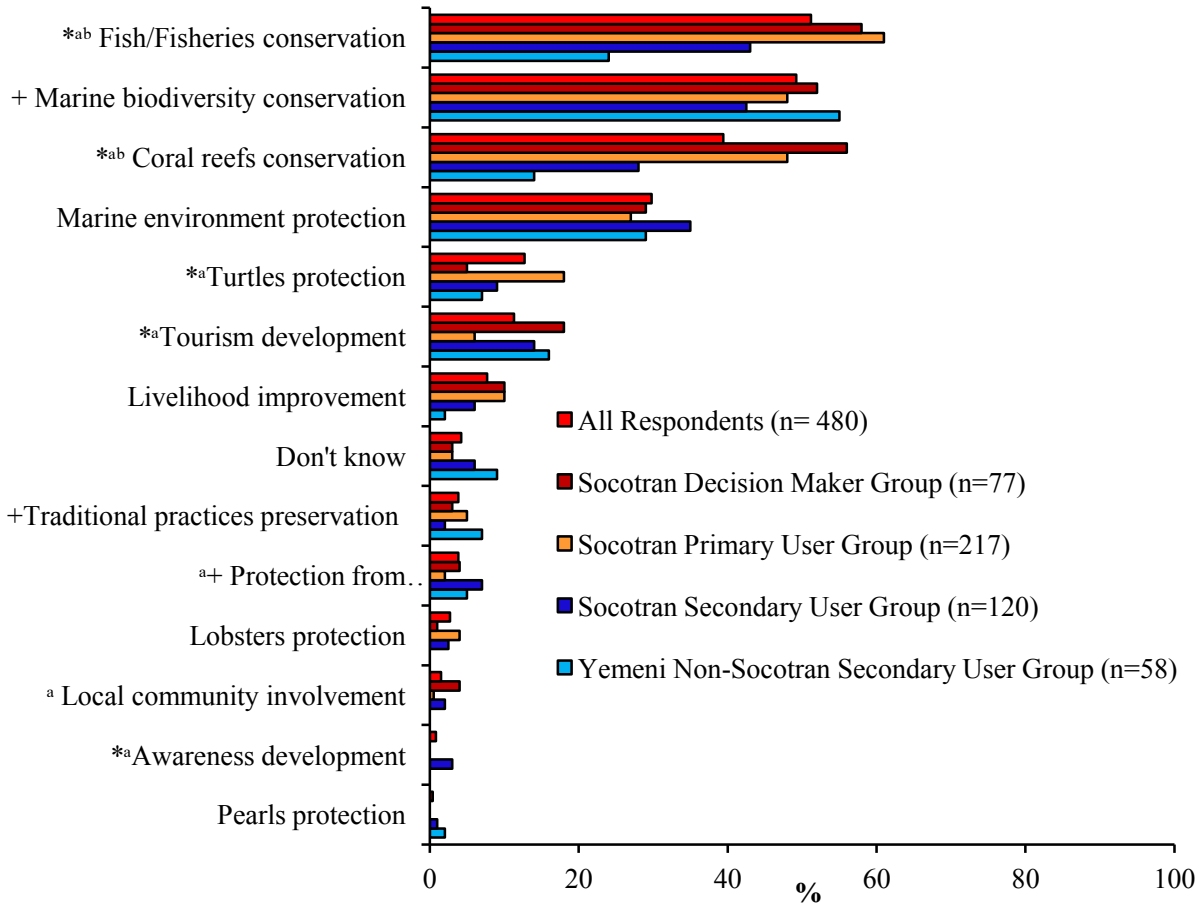


Figure 4.1 Primary management objectives of the Socotra Island MPA mentioned by all respondents and each key stakeholder group (% of respondents).*Statistically significant difference(SSD) within the four key stakeholder groups. [a]SSD within the three Socotran groups. [b]SSD between *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group*. $P <$ 0.05, Fisher's Exact Test, two-sided. +: An objective included in the MPA's CZP.

4.5.1.3 Awareness of the main rationale behind the establishment of the MPA (Survey Question 3)

When respondents were asked what they thought was the main rationale behind the establishment of the MPA, each respondent provided a single reason and 17 reasons were recorded, with no more than 20% of respondents mentioning the same one (Figure 4.2). Of these reasons, fish/fisheries conservation was the most frequently mentioned (19%), followed by marine environment protection (16%), biodiversity conservation (12%), and finally, coral reefs (10%). The other 13reasons were mentioned by less than 10% of respondents. Less than 25%of all respondents were aware that the Yemeni government's main reason for establishing the MPA was marine biodiversity conservation.

Less than a quarter of respondents from any key stakeholder group mentioned marine biodiversity conservation as the main reason behind establishment of the MPA (Figure 4.2). Eighteen percent of respondents from the *Socotran Decision Maker Group* were aware of marine biodiversity conservation. This was a greater level of awareness than the respondents from the *Socotran Primary User Group*, *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group* (6%, 12% and 16%, respectively) ($p < 0.001$).

Fish/fisheries conservation was the most frequently mentioned reason behind the establishment of the MPA by the *Socotran Decision Maker Group* and *Socotran Primary User Group*, whereas the *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group* mentioned marine environment protection most often (Figure 4.2). Twenty-four percent and twenty-two percent of respondents from the *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group* mentioned marine environment protection more frequently than those from the *Socotran Decision Maker Group* (14%) and *Socotran Primary User Group* (12%), respectively ($p = 0.023$). In contrast, 18%, 21%, 21% and 17% of respondents from the *Socotran Decision Maker Group*, *Socotran Primary User Group*, *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group* mentioned fish/fisheries conservation, respectively. There were no statistically significant differences in stating this reason within these four key stakeholder groups ($p = 0.913$), three Socotran stakeholder groups ($p = 0.766$), or between the *Socotran Secondary*

User Group and *Yemeni Non-Socotran Secondary User Group* (p = 0.682). The four key stakeholder groups thought and agreed that fish/fisheries conservation was the main rational behind establishment of the MPA.

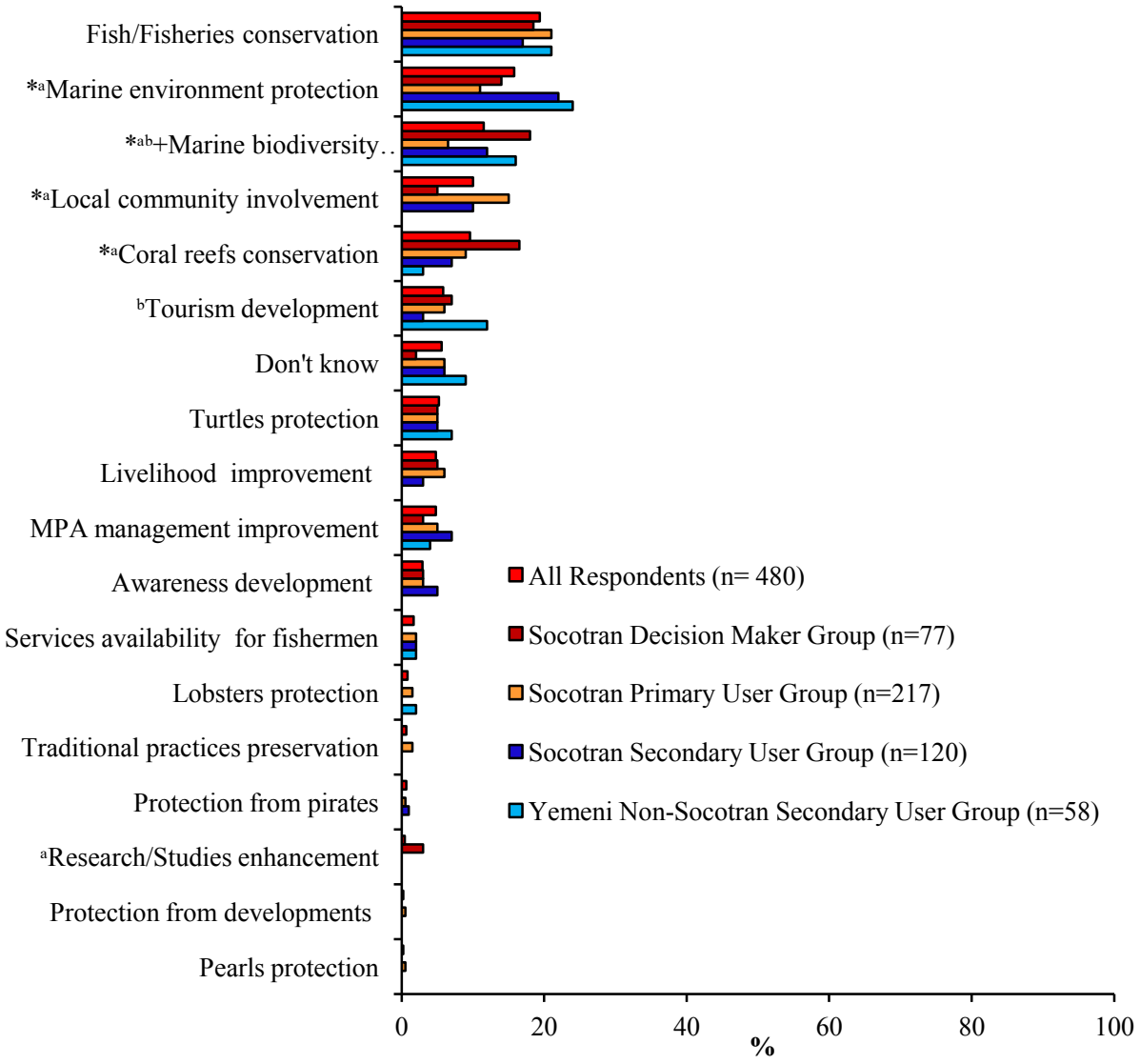


Figure 4.2 The main rationale behind establishment of the Socotra Island MPA as listed by all respondents and each key stakeholder group (% of respondents).*Statistically significant difference (SSD) within the four key stakeholder groups. [a]SSD within the three key Socotran stakeholder groups. [b]SSD between *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group*. $P < 0.05$, Fisher's Exact Test, two-sided. +: The main rationale as determined by the Yemeni government.

4.5.1.4 Awareness of the most important value of the MPA (Survey Question 4)

Respondents most frequently mentioned environmental characteristics (abundant fish (50%), coral reefs (44%), marine biodiversity (37%) and attractive scenery (30%)) as the most ecologically important values of the MPA (Figure 4.3). Less than half of all respondents listed marine biodiversity, which was documented in literature as being the most ecologically important value of the MPA (e.g. IUCN, 2008) (Figure 4.3). Less than 10% of respondents listed other values such as traditional practices and natural heritage.

The key stakeholder groups' awareness of marine biodiversity varied and it was not the most frequent value mentioned by any key stakeholder group (Figure 4.3). Half the respondents from the *Socotran Decision Maker Group* were more aware of marine biodiversity than those from the *Socotran Primary User Group*, *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group* (38%, 36% and 22%, respectively; $p = 0.023$). In contrast, there was no statistically significant difference in awareness of this value between the *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group*.

Abundant fish and attractive scenery were the most frequent values listed by the *Socotran Primary User Group* and *Yemeni Non-Socotran Secondary User Group*, respectively, whereas coral reefs was most frequently mentioned by the Decision Maker Group and *Socotran Secondary User Group* (Figure 4.3). However, 56% of respondents from the *Socotran Decision Maker Group* mentioned coral reefs more frequently than 47%, 37% and 35% of those from the *Socotran Primary User Group*, *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group*, respectively ($p = 0.030$). In contrast, 61% of respondents from the *Socotran Primary User Group* mentioned abundant fish more frequently than 52%, 31% and 45% of those from the *Socotran Decision Maker Group*, *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group*, respectively ($p < 0.001$). Forty-eight of respondents from the *Yemeni Non-Socotran Secondary User Group* mentioned attractive scenery more frequently than 35%, 24% and 21% of those from the *Socotran Secondary User Group*, *Socotran Primary User Group* and *Socotran Decision Maker Group* ($p = 0.001$).

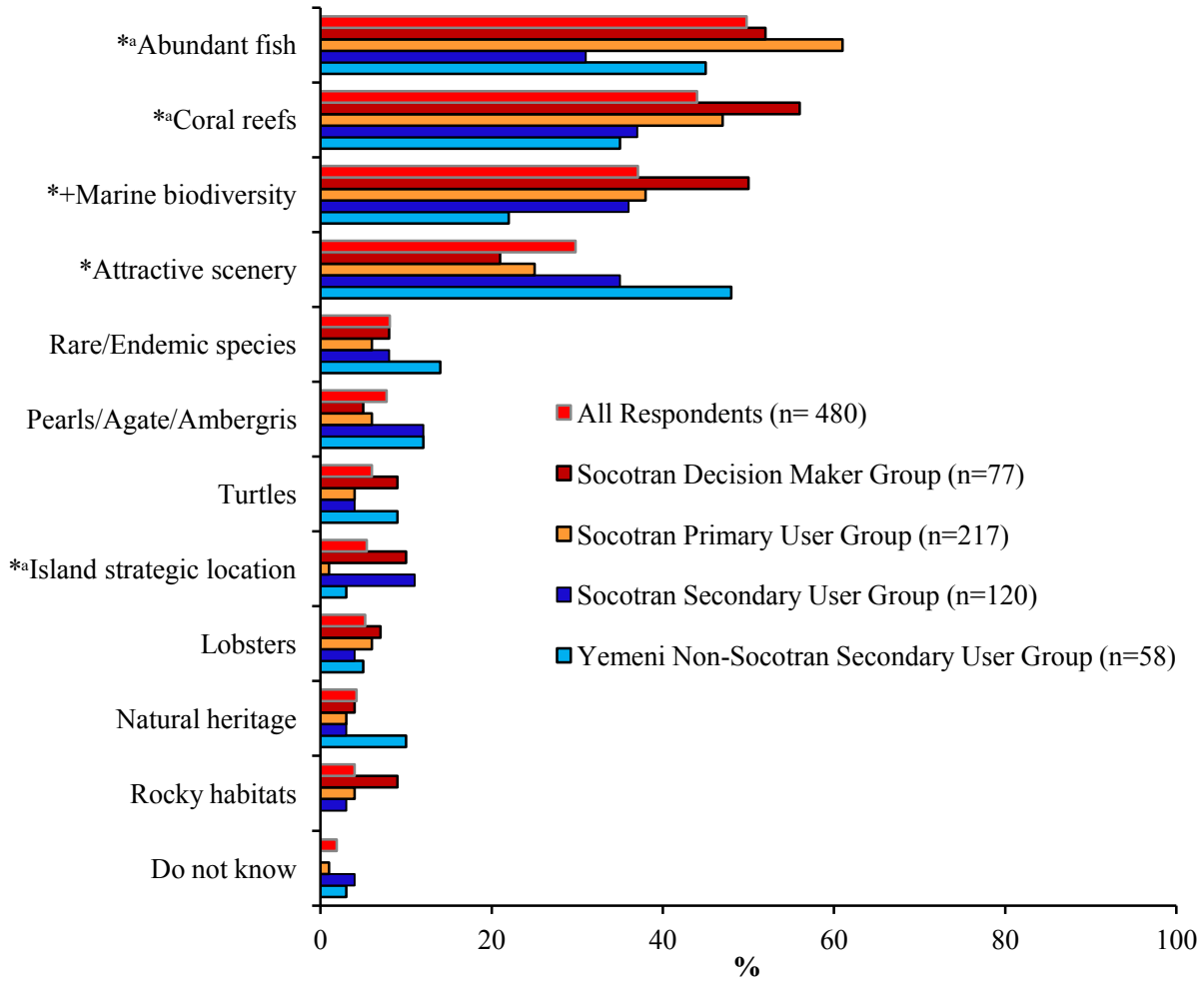


Figure 4.3 Listed important values of the Socotra Island MPA by all respondents and each key stakeholder group (% of respondents). *Statistically significant difference (SSD) within the four key stakeholder groups. [a]SSD within the three key Socotran stakeholder groups. +: The most important value as identified in literature.

4.5.1.5 Awareness of the threats affecting the MPA (Survey Question 5)

All respondents

The respondents differed in how they ranked threats to the MPA (see Figure 4.4). The most frequently mentioned threats were litter (93%), trawling (86%), and Non-Socotran fishers (78%). In contrast, less than 70% of all respondents ranked the three issues identified in the SAMP as threats affecting the MPA (invasive species, resource overexploitation and coastal development).

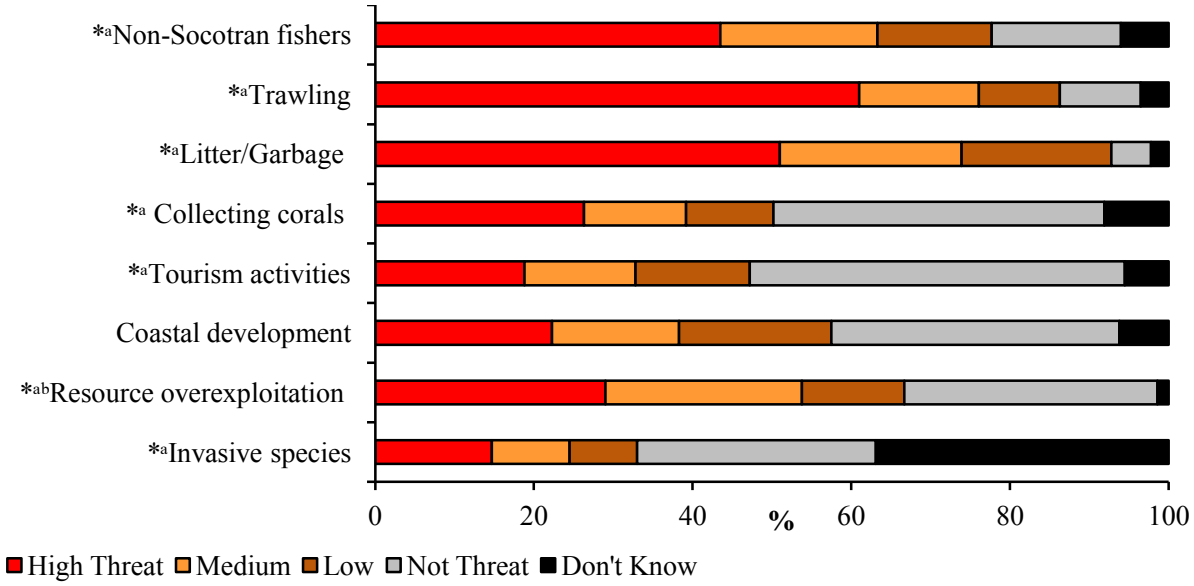


Figure 4.4 Ranked issues threatening the Socotra Island MPA by all respondents (% of respondents, n= 480).*Statistically significant difference (SSD) within the four key stakeholder groups. [a]SSD within the three key Socotran stakeholder groups. [b]SSD between the *Socotran Secondary User Group* and the *Yemeni Non-Socotran Secondary User Group*.

Stakeholder groups

The four key stakeholder groups differed in their ranking of threats affecting the MPA (high, medium and low threats) (Figure 4.5). Litter was the most frequently mentioned threat by the *Socotran Decision Maker Group*, *Socotran Primary User Group* and *Yemeni Non-Socotran Secondary User Group*, whereas trawling was the most frequently mentioned threat by the *Socotran Secondary User Group*. However, there is no statistically significant difference in the ranking of trawling as a threat within the four key Socotran groups (H = 6.352, p = 0.098). However, the *Socotran Decision Maker Group* and *Socotran Primary User Group* more frequently ranked litter as a threat than the *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group* (H = 19.233, $p < 0.000$). In contrast, the *Socotran Secondary User Group* more frequently ranked trawling as a threat than the other two key Socotran stakeholder groups (H = 6.148, p = 0.108). There is no statistically significant difference in the ranking of trawling (Z = -1.053, p = 0.292) and litter (Z = -1.609, p = 0.108) as threats between the *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group*.

4.5.1.6 Awareness of the MPA zoning categories (Survey Question 6)

Only 2% of all respondents (11 out of 480) correctly matched the types of zoning categories with the current CZP. These respondents were from the *Socotran Decision Maker Group* and *Socotran Primary User Group*. The local community's awareness of the zoning categories listed in the MPA's CZP was extremely low.

4.5.2 Community participation in MPA management-related activities (Survey Question 7)

All respondents

Only 31% of all respondents (150 out of 480) had participated in the MPA management-related activities. Sixteen percent of all respondents (73 out of 480) had participated in a single management-related activity offered to them, but the frequency of each activity occurring varied. The awareness-raising programs was the most frequently mentioned activity, mentioned by 10% of all respondents, followed by training programs (2%), meetings (2%) and surveys/studies (2%). The other 15% of respondents (77 out of 480) had participated in more than one activity from these MPA management-related activities.

Stakeholder groups

More respondents from the *Socotran Decision Maker Group* (55%) participated in management-related activities than those from the *Socotran Primary User Group*, *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group* (30%, 27% and 12%, respectively ($p < 0.001$) (Figure 4.6). Only two respondents from the *Yemeni Non-Socotran Secondary User Group* (n=58) had participated in meetings and awareness-raising programs, and no respondent from this group had participated in a training program. More respondents from the *Socotran Secondary User Group* had participated in the management-related activities than the *Yemeni Non-Socotran Secondary User Group* ($p < 0.001$), but the participation for these two stakeholder groups was very low.

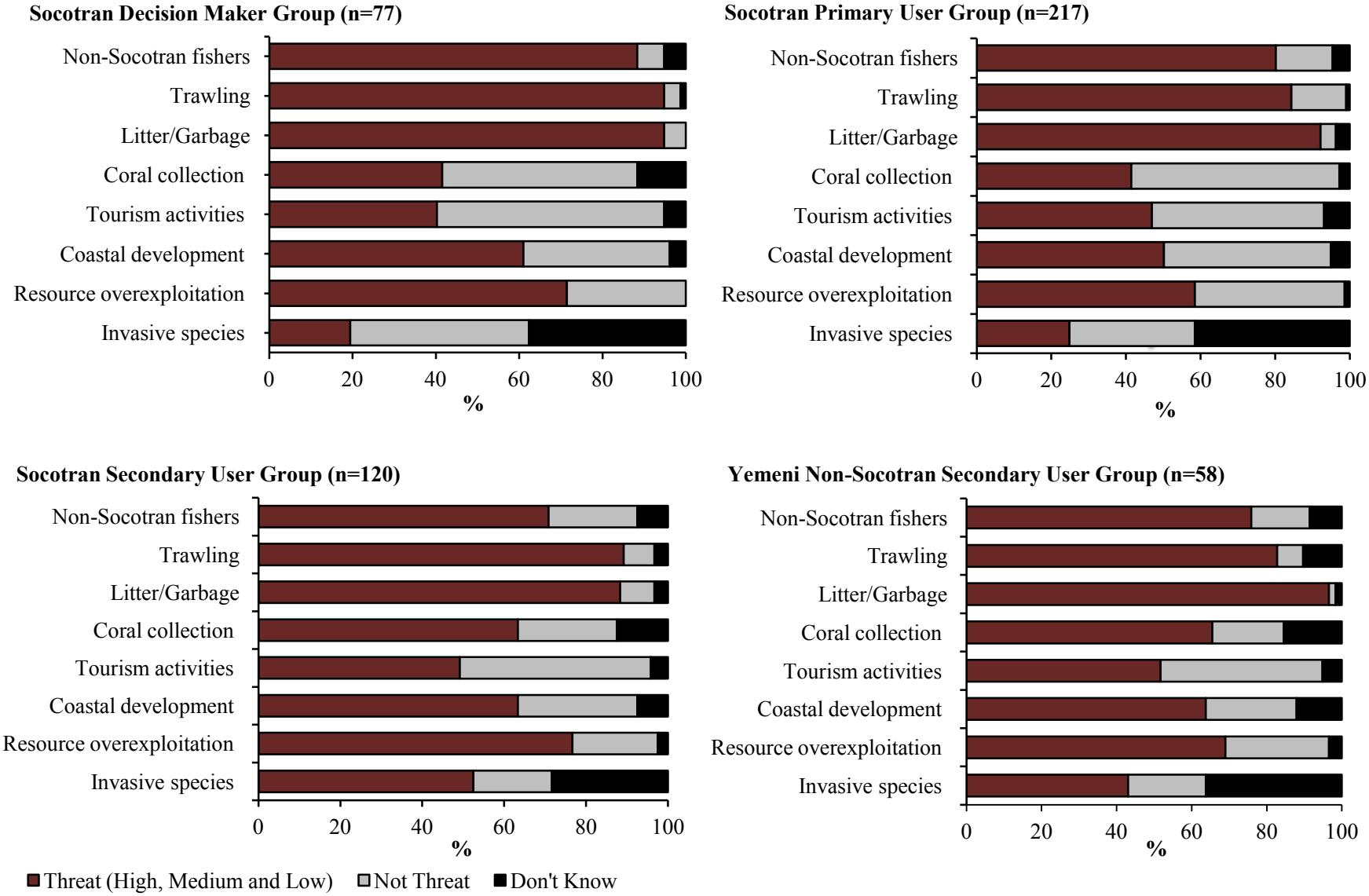


Figure 4.5 Ranked issues threatening the Socotra Island MPA by each key stakeholder group (% of respondents).

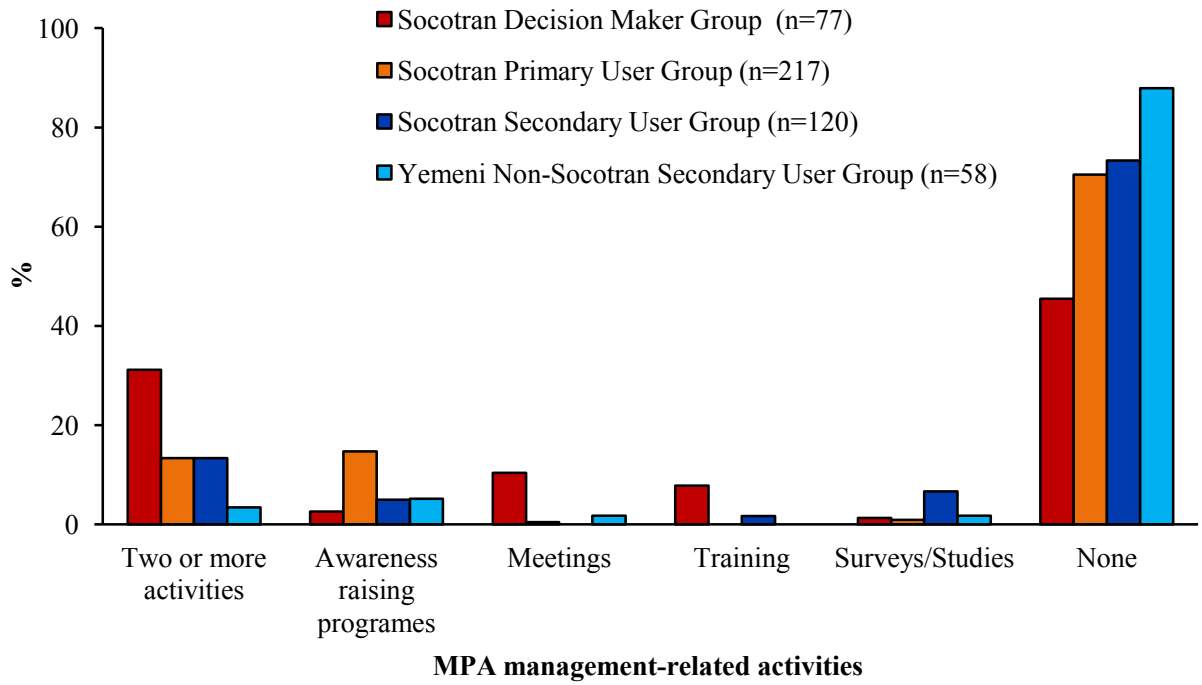


Figure 4.6 Percentages of key stakeholder groups' participation in different management-related activities in relation to the Socotra Island MPA (% of respondents).

4.5.3 Management effectiveness

The scores of the seven indicators related to '*Context'* used to assess the management effectiveness of the MPA in terms of the community's awareness and participation varied from 0 to 2 (Table 4.3). No indicator received a "Very High" score. The highest score obtained (ranked High) was for the indicator related to awareness of a threat identified in the SAMP. The lowest scores (ranked Low) were obtained for the awareness of the correct geographical scope of the MPA, awareness of the rationale behind its establishment as determined by the Yemeni government and awareness of the zoning categories of the MPA.

The Final Score for the management effectiveness of the MPA, in relation to the element of '*Context*', in terms of the community's awareness of criteria and participation in activities relating to its management was 23%. This Overall Score was ranked 'Low', meaning that management of the MPA was inadequate in relation to this element. This suggests that the effectiveness of the MPA in relation to community awareness and participation could be substantially improved.

Table 4.3 Scores of indicators used to measure the management effectiveness of the Socotra Island MPA in terms of the community's awareness and participation in relation to its management (% of respondents, n=480). Scores: 0=Low; 1= Moderate; 2=High; 3 =Very High).

Survey Qs.	Indicators	%	Scores
1	Respondents were aware of the geographical scope of the MPA.	18	0
2	Respondents were aware of a primary objective identified for the MPA management.	49	1
3	Respondents were aware of the main rationale behind establishment of the MPA.	16	0
4	Respondents were aware of the most ecological important value for the MPA.	37	1
5	Respondents ranked one of the priority issues affecting the MPA as a threat.	67	2
6	Respondents were aware of the zoning categories of the MPA.	2	0
7	Respondents participated in an activity relating to the MPA management.	32	1

4.6 Discussion

4.6.1 Overall discussion

Results from this chapter suggest that the management effectiveness of the Socotra Island MPA is inadequate in terms of the local community's awareness of management, and participation in management-related activities. This relates to the '*Context*' element of management effectiveness, as described in Chapter 1. The Overall Score for '*Context*' was ranked as low because the local community had insufficient information about the MPA and low participation in management-related activities of this area. The Yemeni government may benefit from raising environmental awareness, instigating educational programs for the local community and involving them in management-related activities to improve the '*Context*' element of the MPA.

The limited information the community has about the Socotra Island MPA is not unique. For example, Ressurreição *et al*. (2012) reported that local communities were poorly informed about the MPA of Azores Archipelago in Portugal. Faasen and Watts (2007) found that local people lacked information of the usefulness of the Tsitsikamma National Park in South Africa. Elliot *et al.* (2001) also reported that the local community had little information on

the Wakatobi National Park in Indonesia. Lack of information has constrained planning and management of these MPAs. It is clear that some communities worldwide still have insufficient information about their MPAs, though researchers advocate raising awareness by instigating educational programs and involving communities in the management of natural resources in MPAs.

The low level of community participation in activities relating to the management of MPAs is also common, as has been documented in neighbouring countries, including Bahrain, Emirates, Kuwait, Iran, Qatar, Oman and Saudi Arabia (Van Lavieren and Klaus, 2013); the Puerto Morelos MPA in Mexico (Rodríguez-Martínez, 2008); the Tsitsikamma National Park in South Africa (Faasen and Watts, 2007) and MPAs in southeast Asia (Philippines and Indonesia) (Christie, 2004). The participation by stakeholders in the Puerto Morelos MPA management was subject to conflicts with authorities in charge of this area because the community has complete control on the use of financial resources and the ability to make final decisions regarding management issues (Rodríguez-Martínez, 2008). Consequently, this MPA could not meet the management objectives because there is no effective participation. The MPAs in Southeast Asia did not achieve the social objectives because of the limited participation of stakeholders in management-related activities (Christie, 2004). Low participation by community could lead to reduced chances of successfully achieving objectives of MPAs, including biodiversity protection and fisheries sustainability (Helvey, 2004; Agardy *et al.*, 2003; Manson and Die, 2001). Therefore, the participatory approach is still uncommon in MPAs worldwide, though researchers recognise its importance.

4.6.2 Community awareness of the MPA

4.6.2.1 Overall discussion

The results in this chapter indicate that the local community has low awareness of the specific management criteria in relation to the MPA, including geographical scope, management objectives and threats. This is not surprising because awareness-raising programs were assessed as inadequate for the MPA (Chapter 3).

4.6.2.2 Community awareness of the geographical scope of the MPA

The local community, including Yemeni Non-Socotrans, had very low awareness of the geographical scope and designation of the MPA, likely related to inadequate interpretive signage and maps/posters showing the boundaries and zoning categories of the MPA (personal observation, 2011). Another explanation for such a finding is that the MA initiated active management activities, including zone-specific management plans, for three Marine Park Zones (DiHamri, DiTwah and Rosh) during the SCDP III (2003–2008) (Gawler and Mashhour, 2009; Chapter 3) out of 20 zones in Socotra Island (see Appendix A). Given this, the majority of the local community could think that the MPA has only these three zones. For example, a fisherman [incorrectly] indicated, "The whole Socotra Island is not a marine protected area …there are only marine protected sites in DiHamri, DiTwah and Rosh". The inadequacy of pertinent awareness-raising materials could lead the majority of the local community to be unaware that the whole Socotran coast is a protected area.

4.6.2.3 Community awareness of the MPA management objectives

The local community mentioned three of the six objectives listed in the MPA's CZP, indicating that their awareness of them was low. Conservation of marine biodiversity conservation is the main objective outlined in the CZP but less than half of survey respondents identified it. Instead, they identified fish/fishery conservation as a main objective, which while not a primary objective outlined in the CZP is a component of marine biodiversity conservation. This suggested that the local community has major concern for fishery resources, but their objectives do not tightly align with the CZP. However, a noteworthy finding from this chapter was that the key community groups shared similar perception that fish/fisheries conservation was the main objective behind establishment of the MPA. This finding was similar to MPAs in southern Europe, where local community subgroups (conservationists, fishers, recreational User Group, researchers and others) perceived that conservation and fisheries management were the core objectives for establishing these areas (Mangi and Austen, 2008).

It is likely that the management objectives of the MPA were not discussed with the local community, though there were consultative meetings with stakeholders during the development process of the CZP (see Chapter 3). This is a problem because the mismatch in perceptions with the main management objectives, particularly biodiversity conservation, could lead to overexploitation of other marine organisms, including sea cucumbers that are harvested without management (Chapter 3). In particular, the *Socotran Primary User Group*, including *Fishers*, should be involved with the development and refinement of management objectives to improve management of marine organisms in the MPA, which is essential for success of an MPA management (Mangi and Austen, 2008; Himes, 2007). Lack of involvement of such a group in the MPA management may cause unsustainable use of fisheries or conflicts between fishers with the MA in implementing conservation objectives.

4.6.2.4 Community awareness of the threats affecting the MPA

The three top ranked threats to the marine environment of Socotra Island from those mentioned by the local community were: non-Socotran fishers, foreign trawling vessels and litter. These three are also reported in literature (Van Damme and Banfield, 2011; Cheung and DeVantier, 2006; Nichols, 2001) as issues for Socotra Island. Non-Socotran fishers, including Yemenis, occasionally operate offshore. Trawling is not allowed in the waters of Socotra and there is not a modern surveillance boat available for the MPA (Chapter 3). Thus, foreign trawling vessels can operate illegally, and although illegal fishing vessels can often be recognised from the mainland there is little chance of them being caught, especially during the windy season between June and October. Similarly, accumulation of litter along the Yemeni mainland coastline (PERSGA/UNEP, 2008; Yemeni EPA/UNEP, 2003), including Socotra Island (e.g. Van Damme and Banfield, 2011), is well recognised. Certainly, some beaches of the Island have large amounts of plastic litter, particularly in the capital of Socotra Island (Hadibo) and the other town (Qualansya) (personal observation, 2011). Unsurprisingly, the majority of the local community perceived litter as a high threat to the marine environment of Socotra Island. This result is consistent with that found for MPAs in Portugal, where the local community perceived litter is a high threat after sewage (Ressurreição, 2012). Given this level of community concern, perhaps the Yemeni government should consider litter and non-Socotran and foreign trawling fishers as high

threats to the MPA due to their negative impacts on the marine environment (see FAO/UNEP, 2009; UNEP, 2009).

Perceptions and level of awareness regarding threats to the MPA were different from the three threats (coastal development, living resource overexploitation and invasive species) documented in the SAMP. To date, three minor coastal developments, including a small seaport, occur in the capital of Socotra Island (Hadibo) and coastline development was ranked as a non-to-low threat to the MPA by more than half of the respondents. Nearly a third of respondents perceived that there was no overexploitation of living marine resources and thus ranked it as not a threat to the marine environment. The different perceptions of the local community on the threats to the MPA were similar to findings found for the Corvo Island MPA in Portugal (Abecasis, 2013; Abecasis *et al.*, 2013): local and external academic researchers, governmental officers, commercial fishers and tourism operators considered extractive activities such as fishing and harvesting as the most severe threats to Corvo Island, whereas local residents perceived them as mild and usually only when undertaken by people from other islands (Abecasis, 2013; Abecasis *et al.*, 2013).

Invasive species could be introduced to the marine waters of Socotra Island through large vessels, including Indian boats, anchoring in the seaports of the Island. These species are known to threaten biodiversity, marine industries (including fishing and tourism) and human health (Bax *et al.,* 2003). Despite the risk, over a third of the local community (37%) did not identify whether marine invasive species were a threat. The local people may not be aware if any invasive species exist or are not aware of the consequences of such species. Many respondents did not understand the meaning of such species and it took some time to explain the concept of invasive species to them during the survey. Others, including fishers, incorrectly understood it. For example, a fisherman [incorrectly] indicated to me that "these species are dangerous because they stick on our boats and destroy them so we take them out" (he was referring to barnacles, a non-invasive species in the area). The lack of studies on marine invasive species or awareness-raising programs relating to potential impacts of invasive species to the MPA could explain such findings.

4.6.3 Community participation in MPA management-related activities

The finding of low community participation in the MPA management-related activities contrasts to the finding in Chapter 3, which indicated that there was adequate participation of a wide range of stakeholders in such activities. According to the literature review (see Chapter 3), there was a large environmental awareness-raising program delivered to the local community during previous international projects, particularly the SCDP III (2003–2008). However, the results of the community survey in this chapter indicated that less than a third of survey respondents participated in activities relating to this program. More than half of respondents from the *Socotran Primary User Group*, the *Socotran Secondary User Group* or *Yemeni Non-Socotran Secondary User Group* did not participate in any management-related activity, including an awareness program. The possible reasons for such results are that the MA targeted certain local stakeholders, but not a wide array of stakeholder members of the Decision Maker Group, the *Socotran Primary User Group* living in remote areas, or the general public (including Yemeni Non-Socotrans). Socotra Island is large (~3500 km²) and the access to and contacts with remote areas are difficult (personal observation, 2011). The community survey included a wide array of decision makers, general public (Socotrans and Yemeni Non-Socotrans from various subgroups) and people living in remote villages including *Fishers* as primary users and *Village Heads* as decision makers. The noteworthy finding in this chapter highlights the importance of investigating community knowledge of an MPA and involving people from all affected locations, including remote areas, in assessment of management effectiveness of this area.

4.6.4 Implications of the approach

Developing six specific indicators to investigate community awareness and an indicator to elicit the level of their participation in management-related activities was a comprehensive approach to assess the management effectiveness of the MPA in relation to '*Context*'. It has also provided an understanding of whether the MA delivered sufficient awareness-raising programs to the local community, highlighting that while this authority did hold such programs (Chapter 3), their outreach was limited. More than one question asked to a local

community to assess their awareness and participation in relation to an MPA management is needed to provide a clear picture on the extent of management effectiveness of the MPA based on these two main criteria within '*Context*'.

Involving a large number of people within diverse community subgroups, including Yemeni Non-Socotrans, in this assessment of the MPA also highlighted which subgroups were aware or unaware of specific criteria in relation to the MPA. In addition, this approach was able to indicate the participation level of the four key community groups in activities relating to MPA management. This approach will be useful for managers to know which community group have participated more than another, to ensure that all groups are included in future activities. It will also be helpful for them to work towards increasing each group's awareness of important threats to the marine environment, such as invasive species. However, awareness and participation alone are not sufficient for the assessment of the management effectiveness of an MPA from the community perspective because they do not show, for example, other activities of the MA (Chapter 3), or attitudes of the communities towards the management (assessed in Chapter 5).

4.7 Concluding remarks

Assessing the management effectiveness of the MPA within the element of '*Context*' in terms of the local community's awareness of six specific criteria and their participation in management related activities was a comprehensive approach. Additional approaches, such as assessing the satisfaction level of the local community with the MPA management, to include other criteria in relation to the other elements addressed in the IUCN-WCPA Evaluation Framework (*Planning, Inputs, Process, Outputs and Outcomes*) could be valuable for the MEE of the MPA.

The results of this chapter indicate:

1. The local community was generally not aware of the geographical scope and management objectives relating to the MPA; and

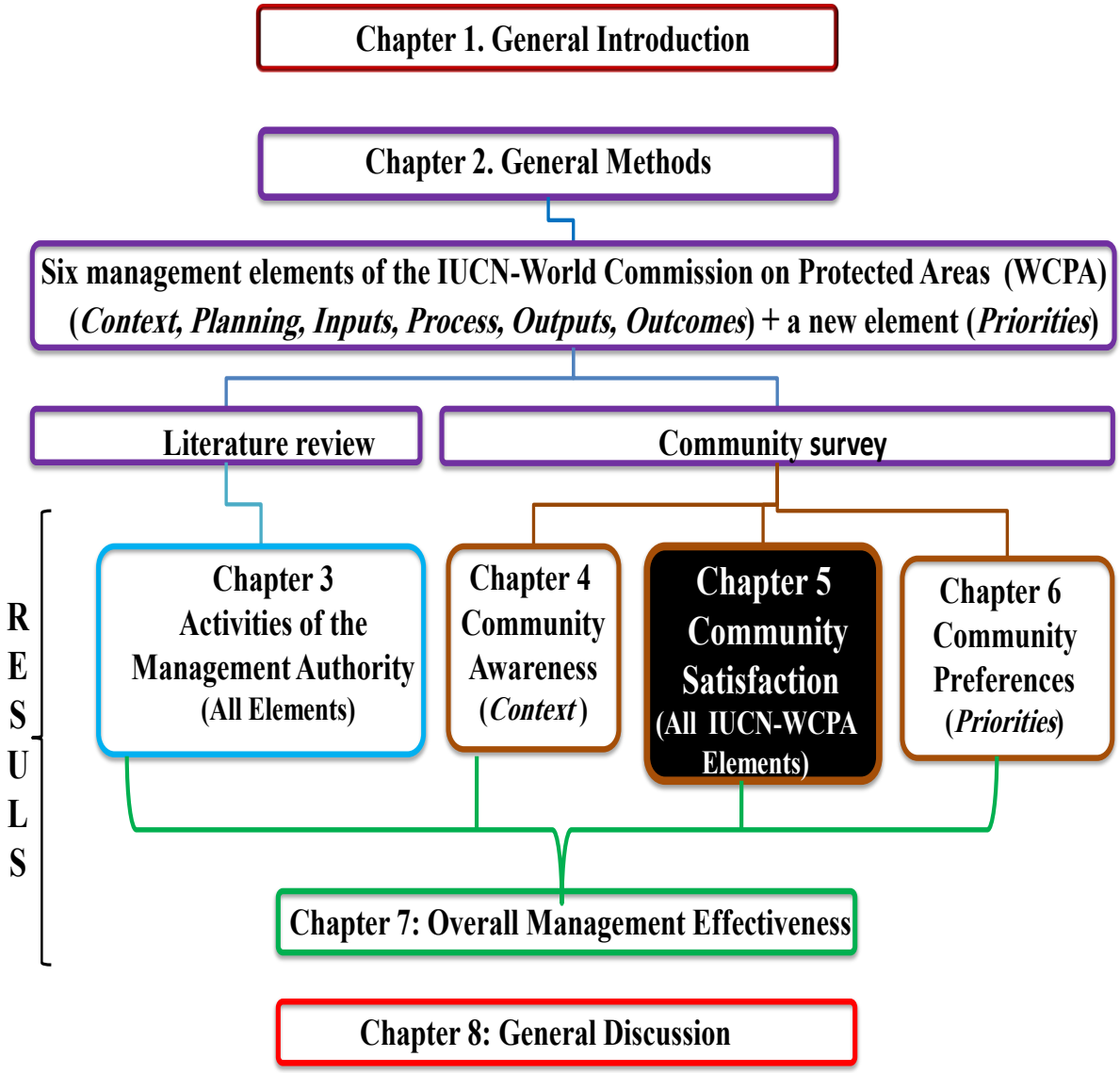
2. There is inadequate participation of the local community in activities related to MPA management. This result is not similar to the results found in Chapter 3.

Therefore, I make the following two key recommendations:

1. Develop awareness-raising and education programs for the local community, which are delivered across multiple community groups, to improve local community awareness of the conservation goals of the MPA; and
2. Develop mechanisms for the effective participation of the local community in activities related to MPA management, taking advantage of the shared visions and the prospects of using all community groups as drivers for unity and change.

The above key recommendations are essential to build relationships of trust between the community groups, including Non-Socotrans, and the MA in order to promote durability of the MPA for conservation of the marine environment and biodiversity of this area. Considering these recommendations may increase management effectiveness of the MPA in relation to '*Context*' in terms of community's awareness and participation relating to its management.

Chapter 5: Community Satisfaction with the Socotra Island Marine Protected Area Management



5.1 Abstract

MPAs could fail to achieve management objectives if coastal communities do not have positive attitudes towards the goals of the MPA. Community satisfaction is a measure of management effectiveness. Understanding community satisfaction is important to identify the people's attitudes towards MPAs and the quality of communication between the local people and the MA. To assess community satisfaction, a scoring system was used to analyse management effectiveness of the Socotra Island MPA. I developed 18 indicators to measure various stakeholder satisfactions with the MPA management based on a community survey. Twenty-three coastal local community subgroups which included Socotrans (n=414) and Yemeni Non-Socotrans (n=66) were involved in this survey. Results suggest that the majority of the local community had negative attitudes about the effectiveness of MPA management; with the MPA management assessed as inadequate. This study detected perceived problematic communication between the MA and the local community with regard to MPA management. Considering various stakeholders' satisfaction with several specific criteria, represented as indicators, allowed me to gain a thorough understanding of how effectively the Socotra Island MPA is managed and the levels of community satisfaction. Such an assessment has the potential to allow managers to review current practices and improve management outcomes of an MPA.

5.2 Introduction

Governments may fail in achieving management objectives of MPAs if local communities do not have positive attitudes towards these areas. The attitudes of communities about management of MPAs are a central issue in managing these areas effectively (Jones, 2008). Understanding these attitudes is fundamental in order to improve the relationship between local communities and managing authorities, whilst allowing them to achieve management objectives of PAs (Weladji *et al.*, 2003). Poor community attitudes could have negative impacts on management of MPAs (Agardy *et al.*, 2003). Failure to consider communities' opinion about MPAs objectives or management may lead to poor public relations, less widely

accepted decisions and lower levels of compliance (Salz and Loomis, 2005; Wolfenden *et al*., 1994). Himes (2007), McClanahan and Graham (2005) and White *et al.* (2002) conclude that for management agencies to be effective in achieving management objectives, including marine biodiversity conservation, community attitudes need to be positive to overcome any real or perceived conflicts between MPA objectives and communities use of marine resources. Thus, investigating attitudes of the communities towards MPAs is important for sustainable management of these resources. However, studies on stakeholder attitudes towards the management of MPAs are limited (e.g. Himes, 2007), though researchers advocated consideration of such key social criterion from different community sectors (see Chapter 1).

Communities from different sectors or regions do not always have the same attitudes about the natural world (e.g. Engel *et al*., 2014; Hockings *et al.*, 2006; Peterson *et. al*, 2005). Attitudes towards an MPA management could vary across different stakeholders and communities, including governmental officials, fishers and teachers. In particular, fishers from different regions can have divergent attitudes about an MPA management because they directly interact with the sea and could be more affected by MA activities (e.g. Pita *et al.*, 2011), especially for large areas such as Socotra Island in Yemen. Therefore, there is a need to investigate attitudes of different local communities, including fishers, about how an MPA is managed, which can be identified through their satisfaction levels with activities of MAs.

An assessment of community satisfaction can be a measure of management effectiveness (e.g. Pomeroy *et al.*, 2004; Staub and Hatziolos, 2004). It can measure the extent of effectiveness of management activities conducted by MAs for managing MPAs. As indicated in Chapter 1, establishing MPAs may have different benefits and/or consequences on the local communities living adjacent to such areas. Therefore, it is important to assess the effectiveness of such activities through measuring community satisfaction with different management criteria, including overall management, legislation, and services in relation to an MPA. This could indicate the impact of MPA management-activities on communities, including fishers, and determine the effectiveness of communication between the authorities responsible for the MPA and the communities living in or adjacent to the MPA. Community satisfaction is measured and included in frameworks and methods that assess management

effectiveness of PAs, including MPAs, (e.g. Hockings *et al.*, 2006; Staub and Hatziolos, 2004), but there is no known well-designed approach that considers diverse community subgroups' satisfaction of various criteria for such an assessment so far.

Although the *WB Scorecard Tool* (Staub and Hatziolos, 2004), as a common method internationally, uses stakeholder's satisfaction for the MEE of MPAs, such an approach is superficial for two main reasons. First, the tool includes only one non-specific criterion, as an indicator, in relation to community satisfaction with management of MPAs. Using several criteria in relation to community satisfaction could provide more comprehensive information on the effectiveness of management-related activities undertaken for MPAs. Second, the *WB Scorecard Tool* (Staub and Hatziolos, 2004) does not specify which stakeholders should be included or invitigate satisfaction across diverse stakeholders. Hockings *et al.* (2006) highlight the importance of involving a wide range of stakeholders, including local communities, in the MEE of PAs, including MPAs. It is possible to involve a diverse range of stakeholders in the assessment and by doing this researchers can indicate which community subgroup has more negative attitudes than others about aspects of MPA management. Managers can then work towards improving their perceptions to achieve management objectives of this area more effectively.

Assessing satisfaction of diverse local community subgroups with several management criteria with the MPA management is an aim of this chapter. These management criteria were related to the six elements (*Context, Planning, Inputs, Process, Outputs* and *Outcomes*) addressed in the IUCN-WCPA Evaluation Framework (Hockings *et al*., 2006; 2000) (see Chapter 1) for MEE of PAs. This chapter aims to assess the effectiveness of the management of the MPA by understanding the community's satisfaction of various management criteria within the context of the IUCN-WCPA Evaluation Framework; indicate community attitudes toward the MPA and the communication between the stakeholders with the MA in managing this area; and explore the validity of this approach as a contribution to the literature and MEE.

5.3 Aims

This chapter addresses the third research question of my PhD thesis, "*To what extent is the local community satisfied with the Socotra Island MPA management?*" Specifically, it aims to answer the following questions:

- Are the local community, including subgroups, satisfied with the overall management and various management criteria in relation to the MPA?
- Is there a correlation between fishers' satisfaction with the overall management of the MPA and the locations where they live in Socotra Island?
- Are there differences within and between stakeholder groups (in their satisfaction with the overall management and management criteria in relation to the MPA)?
- How effective is the MPA management in terms of the community satisfaction with it?

5.4 Methods

5.4.1 Data collection

5.4.1.1 Survey Questions

Two closed-ended questions from the community survey, outlined below, investigated levels of satisfaction of the local community with the MPA management. This survey was based on a questionnaire and respondents were identified within the 23 community subgroups which included Socotrans (n= 414) and Yemeni Non-Socotrans (n= 66) (see Chapter 2). The rationale and coding of the two questions were as follows:

1. *"In general, how satisfied are you with the management of the marine environment of Socotra Island?"* This question aimed to investigate whether the local community was satisfied with the overall management of the marine environment. Respondents were asked to choose one option on a scale of 1–5 (1= Very Satisfied, 2= Somewhat Satisfied,

3= Neutral, 4= Somewhat Dissatisfied, 5= Very Dissatisfied). Respondents were also allowed to choose the option of 'No opinion /don't know'.

To investigate patterns of satisfaction of fishers with the management of the marine environment of the Socotra Island in general (above Survey Question 1) from different regions of Socotra Island I divided the *Fishers* into four groups depending on the distance between fisher residences and the MA office that is located in the capital of Socotra Archipelago (Hadibo). The four groups (see Figure 5.1) were classified as: 1. 'Central location' (within and close to the MA office); 2. 'Non-remote Location' (<1.5 hours from the MA office); 3. 'Remote Location' (~ 2.5 hours from the MA office); and 4. 'Very Remote Location' (~4 hours from the MA office) with 56, 34, 43 and 37 fishers surveyed, respectively. The Very Remote Location was less accessible via vehicles compared with accessibility to the other three locations (personal observation, 2011). The Central Location and Non-remote Locations were grouped into a Non-Remote Area, while the Remote Location and Very Remote Locations were grouped into a Remote Area. Such divisions were made to investigate whether there was a correlation between the satisfactions of fishers with locations and areas as a case study because *Fishers* was the only community subgroup that had representatives from the two towns and all 28 villages visited and had a large enough sample (170) for statistical analysis.

Figure 5.1 Different locations where fishers were interviewed based on divisions in this thesis.

2. *"In relation to management of the marine environment of Socotra Island, how satisfied are you with the following criteria?"* This question aimed to investigate levels of satisfaction of the community with 17 specific criteria in relation to the MPA management. These 17 criteria were related to the 6 management elements (*Context, Planning, Inputs, Process, Outputs* and *Outcomes*) of the IUCN-WCPA Evaluation Framework (Hockings *et al.*, 2006; 2000). These criteria are:
    1. Respondent's participation opportunity in activities relating to the MPA management (*Context*);
    2. Regulation adequacy (*Planning*);
    3. Current zoning plan (*Planning*);
    4. Staff capacity (*Inputs*);
    5. MA facilities/potentials (*Inputs*);
    6. Awareness programs (*Inputs*);

7. Legislation enforcement (*Process*);
8. Socotran roles in the process (*Process*);
9. Information availability (*Process*);
10. Studies and research (*Process*);
11. Public services on the Island (*Outputs*);
12. Services delivered to fishers/locals (*Outputs*);
13. Services provided for women in the coastal areas (*Outputs*);
14. The current state of the marine environment compared with its state before declaration of the legal status of the MPA in 2000 (*Outcomes*);
15. The current state of the livelihood compared to its state before the declaration of the legal status of the MPA in 2000 (*Outcomes*);
16. Tourism activities (*Outcomes*) and;
17. The benefits gained by the respondent form the MPA (*Outcomes*).

The above criteria of management were selected after pre-testing with some community members on the Island. Respondents were asked to choose one option using the same 'satisfied-dissatisfied' scale as above.

5.4.1.2 Effectiveness Assessment

To assess the management effectiveness of the MPA, in terms of community satisfaction with the MPA management, results from the above two key survey questions were used as a collection of 18 indicators. The 18 indicators were provided as questions (see Appendix E). One indicator (*"Is the local community satisfied with the overall management of the MPA?"*) and the other 17 indicators (For example "*Is the local community satisfied with the current zoning plan of the MPA?*"), were answered based on responses from the above survey Questions 1 and 2, respectively. Community satisfaction has been described in the *WB Scorecard Tool* (Staub and Hatziolos, 2004); however, only one non-specific question was used for community satisfaction as an indicator in relation to '*Process*' and '*Inputs*'. In contrast, I used one indicator on the overall management (Question 1) and another17 specific indicators (Question 2) for each of the six elements of the IUCN-WCPA Evaluation Framework (Hockings *et al.*, 2006; 2000).

5.4.2 Data analysis

5.4.2.1 Survey questions

Descriptive analyses were undertaken to explore responses for the above two questions. As indicated in Section 2.3.1, Chapter 2, Kruskal-Wallis (*H*) test was used to test significance of differences in responses (scores) within the four key stakeholder groups:

a) *Socotran Decision Maker Group*;
b) *Socotran Primary User Group*;
c) *Socotran Secondary User Group*; and
d) *Yemeni Non-Socotran Secondary User Group*.

The Kruskal-Wallis (*H*) test was also used to test significance of differences in responses (scores) within the three key Socotran groups (a–c). In this chapter, this test was applied for testing these differences within the 23 community subgroups, the subgroups within each stakeholder group and fishers from the four different locations (Close Location, Non-remote Location, Remote Location and Very Remote Location).

The Mann-Whitney (*Z*) test was applied for testing significance of differences in responses (scores) between the *Socotran Secondary User Group* (group c) and *Yemeni Non-Socotran Secondary User Group* (group d). It was also applied for testing these differences between fishers from the Remote Area and Non-remote Area.

5.4.2.2 Effectiveness management

Similar to the scoring system used by Staub and Hatziolos (2004) and in Chapters 3 and 4, responses to each of the 18 questions – considered as indicators – were scored either 0 (Low), 1 (Moderate), 2 (High) or 3 (Very High) based on the proportions of all respondents who were satisfied with the overall management (Survey Question 1) and each criterion (Survey Question 2) (example in Table 5.1, Appendix E).

Table 5.1 An example of the scoring system for an indicator used to assess the management effectiveness of the Socotra Island MPA in terms of the community's satisfaction with it (From Survey Question 2*: "How satisfied are you with the current zoning plan of the Socotra Island MPA?"*).

Criteria: The MPA zoning plan **Indicator: *Is the local community satisfied with the current zoning plan of the MPA?***	**Scores**
Less than 26% of the community was satisfied with the current zoning plan of the MPA.	0
From 26% to 50% of the local community is satisfied with the current zoning plan of the MPA.	1
From 51% to 75% of the local community is satisfied with the current zoning plan of the MPA.	2
More than 75% of the local community is satisfied with the current zoning plan of the MPA.	3

The Final Score result of the management effectiveness of the MPA in terms of community satisfaction is calculated as a percentage following the same equation used in Chapters 3 and 4, which is indicated below:

Final Score = (Total scores obtained/ Maximum scores of indicators) x100.

The maximum score of the 18 indicators in this chapter was 54 (3 x18). The above equation was also used to assess the effectiveness of the management elements, which had different maximum scores based on the number of indicators. For example, '*Inputs*' included four indicators, so the maximum score of this element was 12. The Final Score was either categorised as Low (0%–0.25%), Moderate (>25%–50%), High (> 50%–75%), or Very High (>75%). Ranks of Low and Moderate were assessed as inadequate while High and Very High were adequate for managing the MPA.

5.5 Results

5.5.1 Satisfaction with the overall management (Survey Question 1)

5.5.1.1 All respondents

A greater proportion of total respondents were dissatisfied (44%) than satisfied (35%) with the overall management of the MPA. A similar response was seen when looking at the proportion of Socotrans only (44% were dissatisfied, whereas 34% were satisfied). Similarly,

a greater proportion of all Non-Socotrans were dissatisfied (47%), but a lower proportion were satisfied (26%) with the overall management of the MPA.

5.5.1.2 Community subgroups/stakeholder groups

Satisfaction varied within the 23 community subgroups and 4key stakeholder groups in terms of the overall management of the MPA (Table 5.2). The highest proportion of satisfaction from a community subgroup with the overall management was obtained from *Tourism Police Officers*, whereas the lowest proportion was from *Educational Faculty Lecturers*. There were no statistically significant differences in the satisfaction scores for the overall management of the MPA within either of the 23 community subgroups (H = 30.201, p = 0.114). There were no statistically significant differences in the satisfaction scores for the overall management of the MPA within the four key stakeholder groups (H = 1.998, p = 0.122), or the three key Socotran groups (H = 0.093, p = 0.995). In contrast, 48% of respondents from the Socotran User Group were more satisfied with the overall management of the MPA than 26% from the Non-Secondary User Group (Z = -1.972, p = 0.049).

From the *Socotran Decision Maker Group*, most of the *Related Governmental Officials* (63% of 8), *Fishery Society Officials* (63% of 11), *Ministry of Fish Wealth Staff* (60% of 5), *Local Council Officials* (58% of 12) and *Village Heads* (56% of 18) were more dissatisfied with the overall management than the other community subgroups within this stakeholder group (H = 16.208, p = 0.022).

Table 5.2 Satisfaction levels of the local community and each key stakeholder group and community subgroup with the overall management of the Socotra Island MPA (Survey Question1: *"How satisfied are you with the management of the marine environment of Socotra Island in general?"*).1= Very Satisfied; 2= Somewhat Satisfied; 4= Somewhat Dissatisfied; 5= Very Dissatisfied.** Statistically significant difference within community subgroups.

Respondents/Stakeholder groups/Community subgroups (n)	**Levels of satisfaction, % of respondents**					
	Satisfied		**Neutral**	**Dissatisfied**		**Don't know**
	1	**2**	**3**	**4**	**5**	
All Respondents (480)	17	15	15	15	30	8
All Socotrans (414)	20	14	14	13	31	8
All Yemeni Non-Socotrans (66)	9	17	15	26	21	12
****Socotran Decision Maker Group* (77)**	17	12	22	13	32	4
MA Staff (11)	36	9	36	10	9	0
Local Council Officials (12)	9	0	33	25	33	0
Fishery Society Officials (11)	9	18	9	27	36	0
Ministry of Fish Wealth Staff (5)	0	40	0	20	40	0
Related Governmental Officials (8)	13	13	13	25	38	0
Village Heads (18)	0	17	22	0	56	6
Coast Guards (3)	33	0	0	0	33	34
Tourism Police Officers (9)	56	11	33	0	0	0
***Socotran Primary User Group* (217)**	20	15	13	9	37	6
Fishers (170)	21	14	13	8	36	8
Harbour Officers (12)	17	17	25	8	33	0
Ex-Marine Extension Officers (11)	27	9	27	0	37	0
Tourism Guides (6)	0	17	17	33	33	0
Other Governmental Staff (14)	21	14	7	0	50	8
Environmental NGOs (4)	0	0	25	50	25	0
***Socotran Secondary User Group* (120)**	21	17	11	19	19	13
Imams (Religious Leaders)(14)	21	14	7	0	37	21
Education Faculty Students (20)	35	20	5	5	25	10
School Officials (6)	33	0	50	17	0	0
Education Faculty Lecturers (5)	0	0	0	100	0	0
School Teachers (20)	20	15	20	35	10	0
Media Correspondents (3)	0	67	0	33	0	0
Food/Goods Suppliers (14)	7	14	7	14	22	36
Handymen (6)	33	17	17	0	0	33
Housewives (32)	28	13	9	16	21	13
***Yemeni Non-Socotran Secondary User Group* (58)**	9	17	10	26	24	14
School Officials (1)	0	0	100	0	0	0
Education Faculty Lecturers (3)	0	0	0	33	67	0
School Teachers (11)	0	9	19	27	27	18
Media Correspondents (1)	0	0	0	0	100	0

Continued Table 5.2

Respondents/Stakeholder groups/Community subgroups (n)	Levels of satisfaction, % of respondents					
	Satisfied		Neutral	Dissatisfied		Don't know
	1	2	3	4	5	
Food/Goods Suppliers (19)	0	21	11	32	21	15
Handymen (10)	10	20	0	30	10	30
Housewives (13)	31	23	8	15	23	0

5.5.1.3 Fishers

Fishers from the same locations in Socotra Island did not have uniform satisfaction with the overall management of the MPA (Figure5.2). However, when data were grouped per region *Fishers* from the Non-remote area were more satisfied (somewhat and very satisfied) with the overall management than the Remote area *(*Z = -3.567, $p < 0.001$). In particular, *Fishers* from the Central Location (42%), Non-Remote Location (44%) and Remote Location (37%) were more satisfied than *Fishers* in the Very Remote Location (5%) (H = 20.207, $p < 0.001$). *Fishers* from the Remote Location were also more satisfied than those in the Very Remote Location (Z = -4.090, $p < 0.001$). In particular, most of fishers from the Very Remote Location were very dissatisfied (65%) with the overall management, compared with the other locations (Figure 5.2).

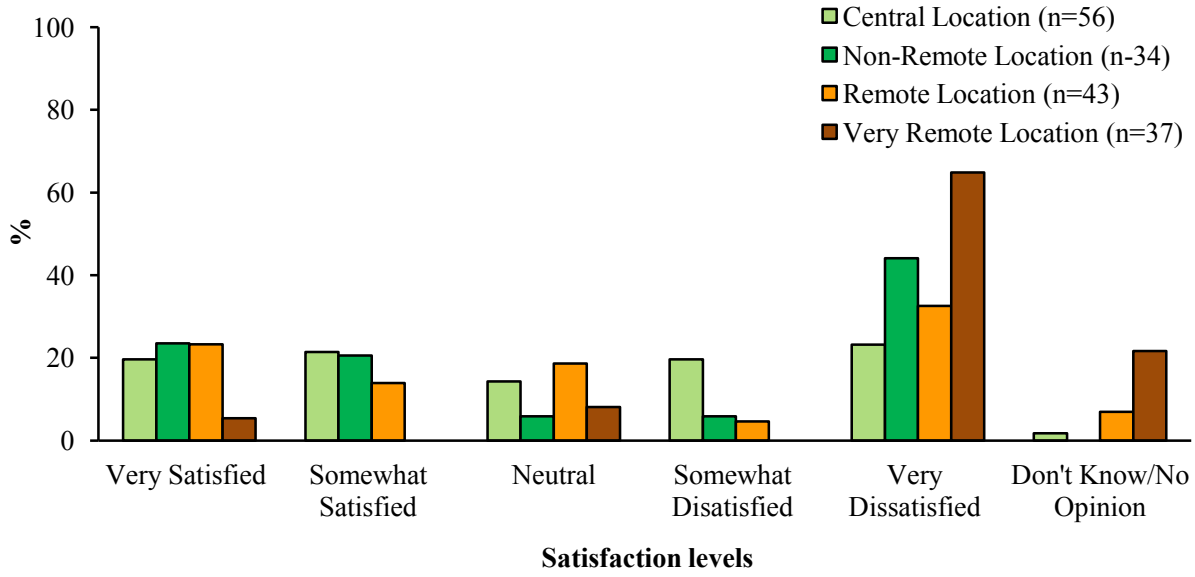


Figure 5.2 Levels of satisfaction of fishers with the overall management of the Socotra Island MPA in different locations of Socotra Island (% of respondents, n = 170) (Survey Question 1*: "How satisfied are you with the management of the marine environment of Socotra Island in general?"*)**.**

5.5.2 Satisfaction with management criteria (Survey Question 2)

5.5.2.1 All respondents

Satisfaction of all respondents with the 17 management criteria in relation to the MPA varied (Figure 5.3). More than half of all respondents were only satisfied (very and somewhat satisfied) with the current zoning plan (58%). In contrast, over half of all respondents were dissatisfied (very and somewhat dissatisfied) with the services delivered for women (70%) and services available for fishers (58%).

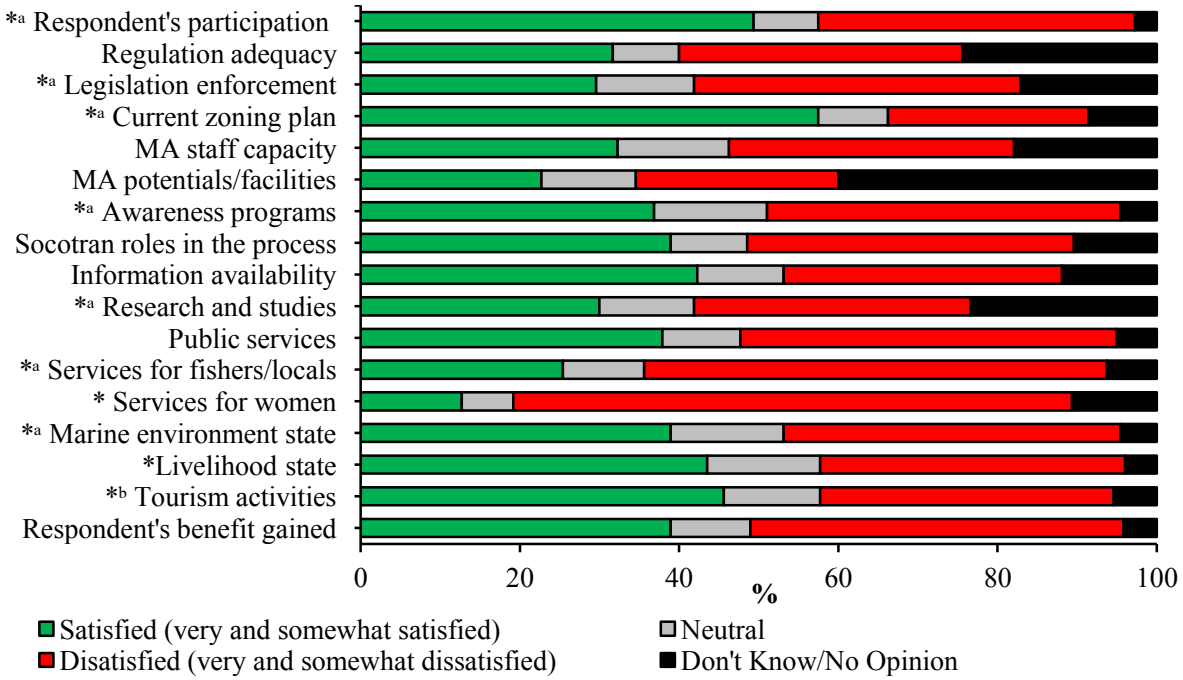


Figure 5.3 Levels of satisfaction of all respondents with different management criteria relating to the Socotra Island MPA (% of respondents, n= 480) (Survey Question 2: *"In relation to management of the marine environment of Socotra Island, how satisfied are you with the following criteria?"*). *Statistically significant difference (SSD) within the four key stakeholder groups for the five satisfaction scores (1, 2, 3, 4 and 5). [a]SSD within the three key Socotran stakeholder groups for the five satisfaction scores. [b]SSD between *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group* for the five satisfaction scores.

5.5.2.2 Stakeholder groups

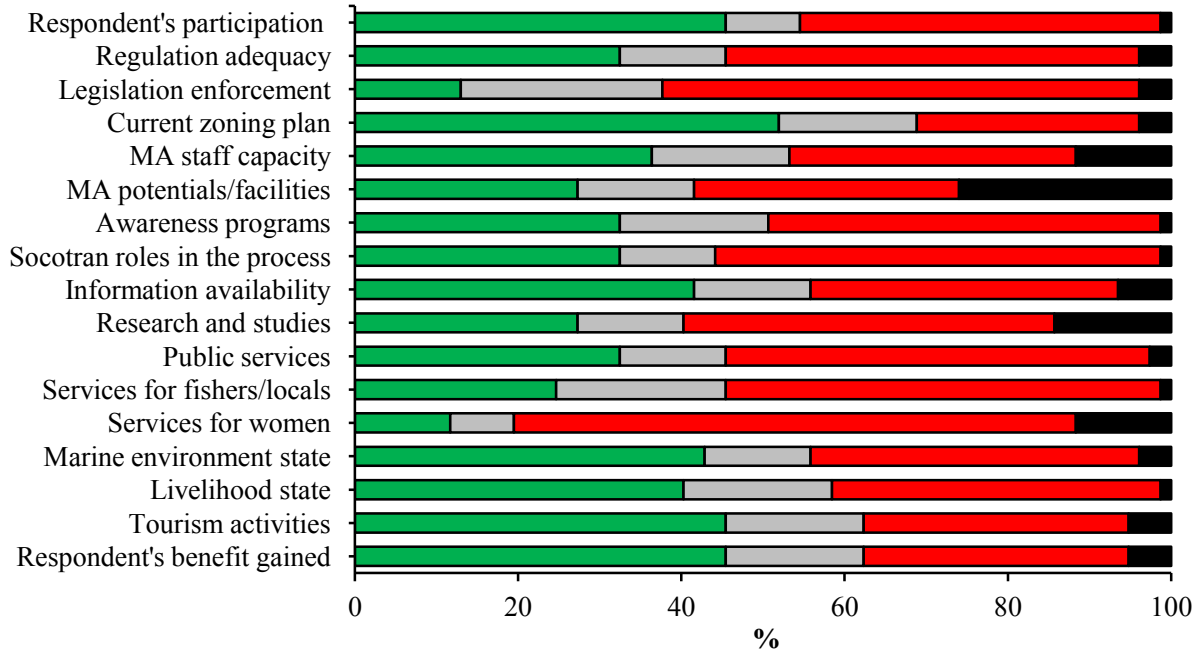
Satisfaction of the 4 key stakeholder groups with the 17 management criteria varied, but more than half of respondents from each group were satisfied with the criterion of current

zoning plan (Figure 5.4). This criterion was considered as the only satisfactory management criterion by all key stakeholder groups.

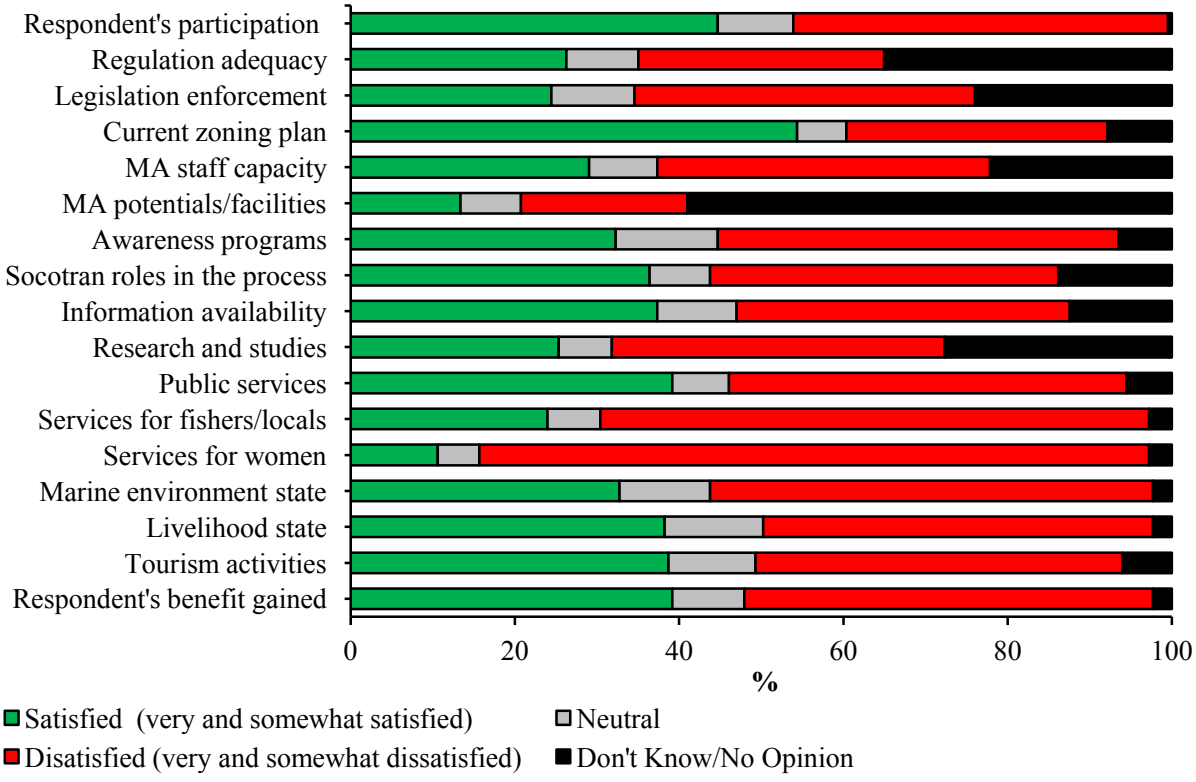
There were statistical similarities and differences in satisfaction levels with each of the 17 management criteria within and between the four key stakeholder groups (see Figure 5.4for the percentages of responses and Table 5.3 for the statistical significant results). There were no statistically significant differences in scores of satisfaction within these groups for the seven management criteria: regulation adequacy, MA staff capacity, MA facilities, information availability, Socotran roles in the MPA process, public services and their benefits gained from the MPA. There were, however, statistically significant differences in scores of satisfaction with the other 10 management criteria. For example, 54% of respondents from the *Socotran Primary User Group* were more dissatisfied with the current state of the marine environment– as compared with its state before declaration of the legal status of the MPA in 2000 – than respondents from the *Socotran Decision Maker Group* (40%), *Socotran Secondary User Group* (34%), and *Yemeni Non-Socotran Secondary User Group* (22%), $H = 19.112$, $p < 0.001$). Forty-eight percent and forty-nine percent of respondents from the *Socotran Decision Maker Group* and *Socotran Primary User Group*, respectively, were more dissatisfied with awareness-raising programs than respondents from the *Socotran Secondary User Group* (37%) and *Yemeni Non-Socotran Secondary User Group* (41%, $H = 17.342$, $p = 0.005$). In contrast, 57% and 55% of respondents from the *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group*, respectively, were more satisfied with the current zoning plan than respondents from the *Socotran Decision Maker Group* (45%) and *Socotran Primary User Group* (45%, $H =18.543$, $p < 0.001$).

There were no statistically significant differences in scores of satisfaction between the *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group* with the 17 management criteria except for tourism activities (Figure 5.4and Table 5.3). Seventy percent of respondents from the *Yemeni Non-Socotran Secondary User Group* were more satisfied with tourism activities than forty-three percent from the *Socotran Secondary User Group* ($Z = - 2.862$, $p = 0.004$) (Figure 5.4).

Socotran Decision Maker Group (n = 77)



Socotran Primary User Group (n = 217)



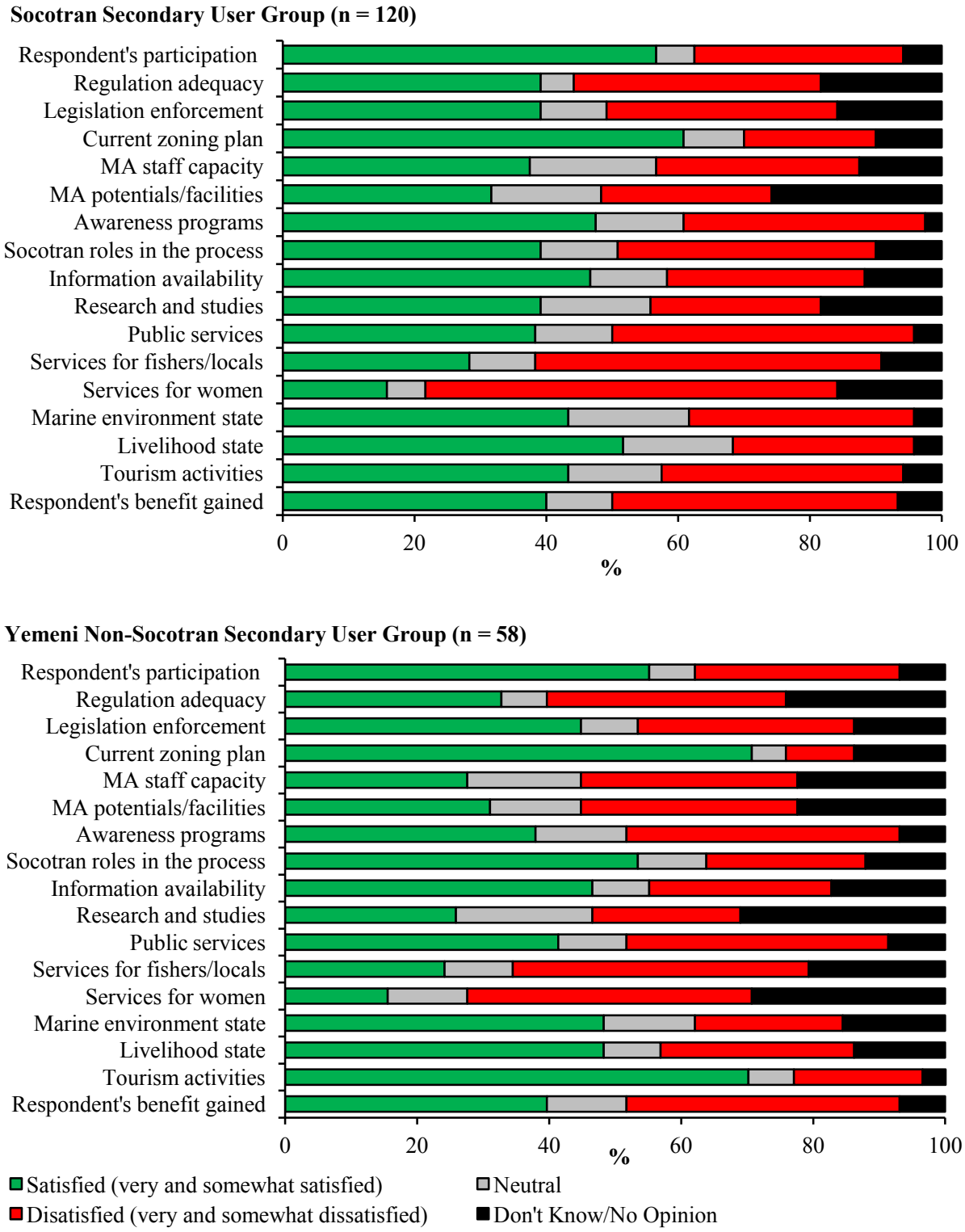


Figure 5.4 Levels of satisfaction of key stakeholder groups with different management criteria relating to the Socotra Island MPA (% of respondents) (Survey Question 2: *"In relation to management of the marine environment of Socotra Island, how satisfied are you with the following criteria?"*).

Table 5.3 Values of significances and patterns of satisfaction with 17 different management criteria relating to the Socotra Island MPA between key stakeholder groups (Survey Question 2:*"In relation to management of the marine environment of Socotra Island, how satisfied are you with the following criteria?"*). Key stakeholder groups: A: *Socotran Decision Maker Group*; B: Primary Secondary User Group; C: *Socotran Secondary User Group*; D: *Yemeni Non-Socotran Secondary User Group*.

Management criteria	****Differences in scores of satisfaction**		*****Patterns of the differences**		**Median of scores**			
	Within key stakeholder groups	Within key Socotran stakeholder groups	Between key stakeholder groups	Between key Socotran stakeholder groups	A	B	C	D
Context								
Respondents' participation	* *P*= 0.005	**P* = 0.007	A B < C D	A B <C	3	3	2	2
Planning								
Regulation adequacy	*P* = 0.367	*P* = 0.217	A BC D	A B C	4	3	3	3
Current zoning plan	**P* < 0.001	**P* = 0.001	A B < C D	A B >C	2	2	2	2
Inputs								
MA staff capacity	*P* = 0.101	*P* = 0.054	A B C D	A B C	3	4	3	3
MA potentials/facilities	*P* = 0.187	*P* = 0.094	A B C D	A B C	3	3	3	3
Awareness programs	**P* = 0.010	**P* = 0.005	A B>C D	A B >C	4	3	3	4
Process								
Legislation enforcement	**P* < 0.001	**P* < 0.001	A B > C D	A B>C	4	4	3	2
Socotran roles in the process	*P* = 0.060	*P* = 0.285	A B C D	A B C	4	3	3	2
Information availability	*P* = 0.072	*P* = 0.089	A B C D	A B C	3.5	3	3	2.5
Research and studies	**P* = 0.003	**P* = 0.003	A B >C D	A B >C	4	4	3	3
Outputs								
Public services	*P* = 0.181	**P* = 0.508	A B C D	A B C	4	4	3	3
Services for fishers/locals	**P* = 0.023	**P* = 0.029	A B > C D	A B >C	4	5	4	4
Services for coastal women	**P* = 0.021	*P* = 0.231	A B C > C D	A B C	5	5	5	4
Outcomes								
Marine environment state	**P* = 0.001	**P* = 0.007	B>A C D	B>A C	3	4	2	2
Livelihood state	**P* = 0.049	*P* = 0.075	A B<A C D	A B C	3	3	2	2
Tourism activities	**P* < 0.001	*P* = 0.053	B>A C<D	A B C	3	3	3	2
Respondent's benefit gained	*P* = 0.556	*P* = 0.860	A B C D	A B C	3	3	3	2.5

*Statistically Significant Difference. **Based on results of Kruskal-Wallis test. *** The underlined groups were significantly different from each other (> is more dissatisfied than; < is more satisfied than).1= Very Satisfied; 2= Somewhat Satisfied; 3= Neutral; 4= Somewhat Dissatisfied; 5= Very Dissatisfied.

5.5.3 Mean level of satisfaction with the MPA

A greater proportion of all respondents were dissatisfied (41%) than satisfied (35%) with the MPA management, in terms of both the overall management (survey Question1) and across all 17 management criteria (survey Question 2) (Figure 5.5). The *Socotran Decision Maker Group* and *Socotran Primary User Group* were more dissatisfied with the MPA management than the *Socotran Secondary User Group* (H = 19.281, p< 0.001) and *Yemeni Non-Socotran Secondary User Group* (H = 9.740, p = 0.008) (Figure 5.5). In contrast, there was no statistically significant difference in scores of the mean satisfaction with the management of the MPA between *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group* (Z = -.212, p = 0.832).

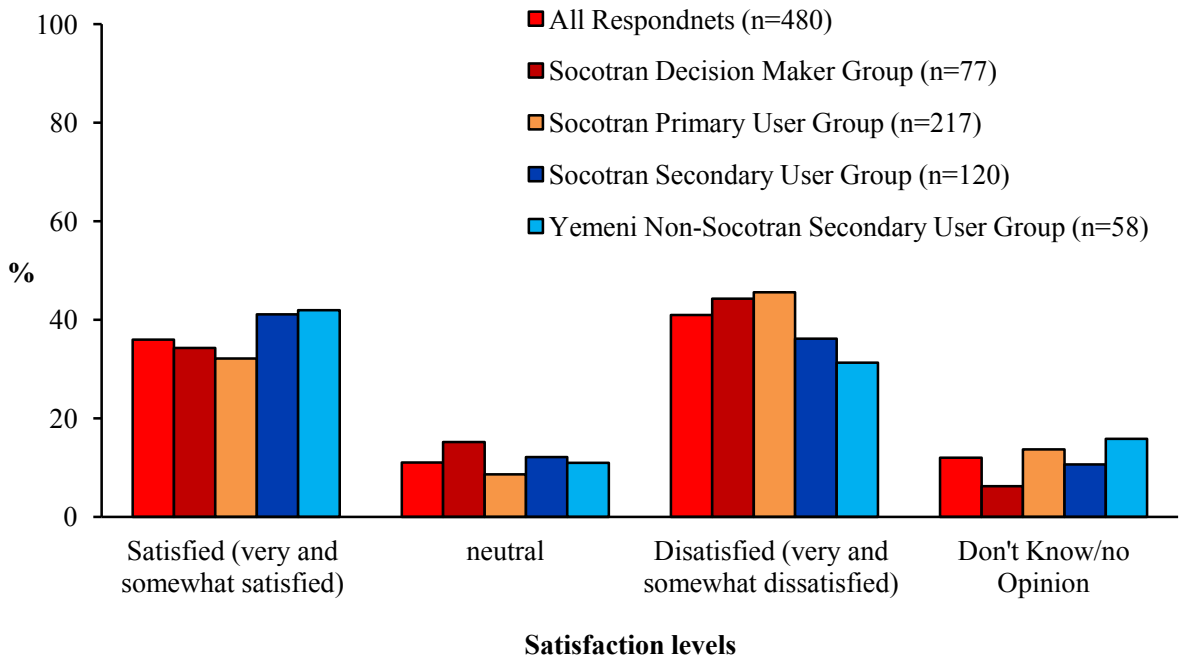


Figure 5.5 Mean percent levels of satisfaction of all respondents and key stakeholder groups with the Socotra Island MPA management.

5.5.4 Management effectiveness

The scores of all indicators in relation to the MPA management (survey Questions1 and 2) varied, but the highest score obtained (ranked High) was for the current zoning plan '*Planning*' (Table 5.4). In contrast, the lowest score (ranked Low) was obtained for facilities

of the MA ('*Inputs*') and services provided for women in the coastal areas ('*Outputs*'). The highest final score obtained was for '*Planning*' (Table 5.4), which was ranked as Moderate (50%). In contrast, the lowest final score were obtained for '*Inputs'* and '*Outputs*', which were ranked as Low (22%). The Final Score (31%) for the management effectiveness of the MPA–in terms of community satisfaction–was ranked as Moderate.

Table 5.4 Scores of indicators used to assess the management effectiveness of the Socotra Island MPA in terms of community's satisfaction with its management. Scores: 0 = Low; 1= Moderate; 2 = High; 3 = Very High. Final score: Low (0–25%); Moderate (>25%–50%); High (>50%–75%); Very High (>75%).

General and management elements	Criteria/Indicators	%	Scores	Final scores
General	Overall management	33	1	33%
Context	Respondents' participation	49	1	33%
Planning	Regulation adequacy	32	1	50%
	Current zoning plan	57	2	
Inputs	MA staff capacity	32	1	22%
	MA facilities	23	0	
	Awareness program	37	1	
Process	Legislation enforcement	30	1	33%
	Socotran roles	40	1	
	Information availability	42	1	
	Research and studies	30	1	
Outputs	Public services	38	1	22%
	Services for fishers/locals	26	1	
	Services for coastal women	13	0	
Outcomes	Marine environment state	39	1	33%
	Current livelihood	44	1	
	Tourism activities	46	1	
	Respondents' benefits gained	39	1	

Note: The above 18 indicators were related to the two key survey questions used in this chapter; the top one (*General*) related to Survey Question 1 and the others to Survey Question 2.

5.6 Discussion

5.6.1 Overall discussion

Results from this chapter show that the effectiveness of the MPA was ranked as Moderate, assessing management of this area as inadequate in terms of community satisfaction. This suggests that the majority of the local coastal community from Socotra Island did not have

complete positive attitudes about the MPA management. It may be important for the Yemeni government to consider improving community perceptions of management, to allow improvements to its future management effectiveness. The MA could share information about activities of the MPA with the local community, including people living in remote regions, to explore which management-related activities could be negative or positive for them. Regular communication with the local community would be a key element for this purpose. Doing this would enable the community to feel that their inputs were being considered in the management of the MPA. The Yemeni government could also consider co-management approaches. Such initiatives could improve attitudes of the local community about the management effectiveness of the MPA because they would be involved in the management process. Local communities can have adequate information on issues relating to marine resource conservation when they are involved in managing MPAs. Fiallo and Jacobson (1995) found that the positive attitude levels of respondents tended to increases with resident's knowledge about conservation issues for a national park in Ecuador.

The lack of positive attitudes of the local community to the management of an MPA is not unique to the Socotra Island MPA. Similar findings are documented for: 17 MPAs in Thailand (Bennett and Dearden, 2014b); 22 MPAs in neighbouring countries (Bahrain, Emirates, Iran, Kuwait, Saudi Arabia, Oman and Qatar) (Van Lavieren and Klaus, 2013); and an MPA in Australia (Sutton and Tobin, 2009). The main reasons for the low positive attitudes among communities mentioned by these researchers were similar to my study. Bennett and Dearden (2014b) found that attitudes of coastal communities about 17 MPAs in Thailand were generally negative due to poor governance and management process. Similarly, the attitudes of coastal stakeholders about the 22 MPAs in the neighbouring countries were generally negative because these people were dissatisfied with the management process and outputs of these areas (Van Lavieren and Klaus, 2013). Finally, Sutton and Tobin (2009) found that fishers were dissatisfied with consultations regarding rezoning of the Great Barrier Reef Marine Park in Australia. It is clear that local communities' lack of involvement in MPA planning and implementation can lead to negative attitudes about management effectiveness of many MPAs in the world.

5.6.2 Community satisfaction

The majority of the local community was not satisfied with the management of the MPA. However, the majority of the Socotra Island community was satisfied with one criterion (the current zoning plan) in relation to the MPA management. This plan, named the Conservation Zoning Plan (CZP), includes different zoning categories (see Appendix A). It was approved by the Yemeni *Presidential Decree No. 275 of 2000*. Other protected areas in Yemen do not have such a decree to date. There are three possible reasons for satisfaction of the majority with the zoning plan. First, many national and international tourists visited the marine park zones in Socotra Island after declaration of the MPA (personal observation, 2008 and 2011), which contributed to increase incomes for local people. Second, there were no effective patrolling systems or legislation enforcement on using marine resources because the CZP was not completely implemented as discussed in Chapter 3. Third, almost all respondents were not aware of the zoning categories as I found in Chapter 4, meaning that they did not have correct information on the zoning plan.

Results from this chapter support the concept that local communities do not always possess the same attitudes about the natural world (Peterson *et al*., 2005), as can be seen in the differences within and between community subgroups and key stakeholder groups in their satisfaction level with the overall management and criteria of management, including zoning design. Similar findings were made by Engel *et al*. (2014) and Suman *et al.* (1999). Engel *et al.* (2014) found that there were statistically significant differences within fishers, tourists and people from the economy and education sector in their attitudes about the Ilha dos Lobos MPA in Brazil, where fishers were the most negative but people from this sector were the most positive about management of this area. Suman *et al.* (1999) found that stakeholder groups possess different attitudes about the designation, processes and outcomes of the Florida National Key Sanctuary in the United States of America.

Most subgroups from the *Socotran Decision Maker Group*, including *Local Council Officials* and *Village Heads*, were dissatisfied with the overall management because they believe that the Environmental Protection Authority (EPA) – as the MA – is not effective. Some responses from these subgroups revealed frustrations and feelings of powerlessness with their

inputs in decision making in the MPA management. One fishery society official's comment summarised this view when he mentioned: "the EPA does not involve people from office of Ministry of Fish Wealth or fishery societies in the management". Some subgroups from the *Socotran Decision Maker Group* were disappointed with communication of the MA with them. A head of a very remote coastal region adjacent to a Natural Sanctuary Zone in Socotra Island stated: "staff of the EPA has not yet visited my region". Such perceptions indicate that involvement of stakeholders in the MPA management is not yet effective. Many respondents perceived that the MA does not adequately protect the marine environment of Socotra Island: "there is no surveillance on trawlers or poachers", highlighted by a local council official as an example. A similar finding was made by Bennett and Dearden (2014b), who reported that coastal communities in Thailand (in relation to 17 National Marine Parks) perceived that the Department of National Parks, Wildlife and Plant Conservation – as a MA– does not have control over the sea.

Tourism Police Officers, from the *Socotran Decision Maker Group*, was the only community subgroup satisfied with the overall management of the MPA. Their active involvement in management of the MPA and benefits gained from it could explain their satisfaction. *Tourism Police Officers* are involved in surveillance and enforcement of the recent local by-laws, including fines for killing turtles or eating their eggs during their nesting season within the MPA (personal observation, 2011). They can gain financial benefits as subsidy allowances for these tasks. *Tourism Police Officers* were involved and gained some financial incentives during an international environmental project, funded mainly by the GEF during 2003 and 2008for Socotra Island (see Chapter 3), for the same purpose.

A noteworthy finding from this chapter is that there was a correlation between satisfaction levels of fisher respondents with their homeport locations. *Fishers* in the very remote location were more dissatisfied with the overall management of the MPA than those in the remote location and the two non-remote locations on Socotra Island. Such results are consistent with what Pita *et al.* (2011) reported in the correlation of fishers' attitudes with locations. They point out that common trends in fishers' attitudes were observed irrespective of geographical locations, but divergent attitudes and perceptions were also observed within fishers from different locations and within different groups of fishers from the same location.

A fisher living in the very remote location stated: “we do not see the staff of the environment in this region”, suggesting that the MA has inadequate communication with fishers. Similar findings were made by Oikonomou and Dikou (2008), who found that fishers from the National Marine Park of Alonissos in Greece perceived a total lack of communication with management bodies. Similarly, Himes (2003) noticed that most fishers in Italy perceived communication to be lacking. The results in Chapter 3 also indicated that there was inadequacy of communication between the MA and the local community, including *Fishers*. Communication between the MA with the local community living in very remote coastal villages on Socotra Island is likely to be difficult due to the large size of the Island (3625 km²), challenging access to remote areas, and the small annual budget (~US$3,000) allocated for the MA (see Chapter 3).

It is clear that the MA does not actively involve several community subgroups, particularly in decision making, and each of the stakeholder groups do not gain equal benefits from the MPA. Successful management of MPAs requires active involvement of different stakeholders and communities in decision making and their perception of benefits from management (Pomeroy *et al.,* 2007; Da Silva, 2004; Agardy *et al.,* 2003; Geoghegan and Renard, 2002; Pollnac *et al.,* 2001). Lack of involvement within stakeholder groups could lead to reduced chances of successfully achieving objectives of MPAs, such as biodiversity protection and fisheries sustainability (Helvey, 2004; Agardy *et al.*, 2003; Manson and Die, 2001). Unequal allocation of benefits is a common source of contention within stakeholder groups (Fernandez, 2007). Therefore, the equity in active involvement and benefits within the community subgroups should be considered to achieve the MPA management objectives, including marine biodiversity conservation, effectively.

Another noteworthy finding from this study is that there were no statistically significant differences between the *Socotran Secondary User Group* and Yemeni Non-Socotran User Group with all 17 management criteria except for tourism activities, which could be for two reasons. First, tourism is a potential revenue stream for the community members from the *Yemeni Non-Socotran Secondary User Group* and these people perceive that negative responses from tourist activities could affect development of this sector. Second, this group may believe that the current tourist activities do not yet significantly affect the marine

environment of the MPA since development of the tourism sector is inactive to date (Chapter 3).

Differences in socio-cultural and economic factors between the 23 community subgroups and the time of residence between the Socotran and Yemeni Non-Socotran respondents are likely to drive divergences in satisfaction levels with the MPA management. Other studies have shown similar results, with attitudes regarding PAs being influenced by the length of residence, employment, and the degree of economic dependence on marine resources of MPAs (Strickland-Munro,2010; Faasen and Watts,2007; Deery *et al.,* 2005). This is driven in part because people that have been residing and working in a marine area for many decades have long-term attachment to place and knowledge about these resources (Ruddle, 2000; Ruddle and Akimichi, 1984). Cinner *et al*. (2010) found that fishers' knowledge differed from the general public in that they have more information about living resources of MPAs in Kenya. Socotrans and Non-Socotrans have different times of residence on Socotra Island. Yemeni Non-Socotrans moved to the Island a few years after unification of Yemen in 1990 to work, mainly at its capital. They have very short residence on the Island compared with Socotrans who have lived on it for at least two millennia (Elie, 2009). Community subgroups from the *Socotran Primary User Group*, particularly *Fishers*, are likely to have more knowledge about the marine environment of Socotra Island than subgroups from the other key stakeholder groups, especially *Yemeni Non-Socotran Secondary User Group*. Further, each community subgroup in this study is different from each other in terms of their inputs into and perceptions of the management and economic dependence on the MPA.

5.6.3 Implications of the approach

5.6.3.1 Strengths and challenges

The approach used in this chapter to investigate satisfaction levels of the local community, in conjunction with how management was perceived, provided useful insights into the strengths and challenges of MPA management. Using the 18 different indicators based on responses from the community survey and consideration of various community sectors allowed an understanding of the extent to which the MPA is effectively managed in regards to

respondent's satisfaction levels. Investigating levels of satisfaction of the 480 respondents within the 23 different community subgroups gave a picture of each group's attitude about the MPA. The approach identified which local community subgroup and key stakeholder group had a positive or negative attitude to the overall management of the MPA. It gave an indication on the quality of the relationship between each group with the MA. However, obtaining such results from diverse community subgroups was a challenge because of differences in their knowledge about the MPA. Many respondents recorded that they "Don't know" what their satisfaction level was (Table 5.2; Figure 5.4). For examples, 40% and 24% of respondents answered "Don't know" for the management criteria of the MA potentials/facilities and regulation adequacy to the MPA respectively. The reasons for such results could be a lack of information about the MPA provided by the MA or the fact that the respondents did not really understand the questions. Potentially, the presence of a "Don't know" option confused readers and it may have been interpreted as a legitimate or meaningful response. Experimenting with scales prior to implementation of the survey may have been useful. For example, if the option to state "Don't know" was removed, fishers may have been comfortable enough to list that they were either satisfied or dissatisfied.

5.6.3.2 Further studies

An important direction for future research would be to assess the correlation between attitude levels towards several management criteria relating to an MPA with different socio-cultural and economic factors, such as resource dependencies and incomes of respondents. This may give insights into why some people are more likely to be dissatisfied than others. I recommend investigating the correlation of such factors with satisfaction of the local community with the management criteria addressed in this study. Another direction for future research would be to explore the issues around management improvement and improving the perceptions of management. I recommend investigating whether there is a correlation between improvement of MPA management and people's attitude levels towards this management. This could give an even clearer picture of MPA effectiveness from different perspectives.

One issue when evaluating the significance of services for women is that only 15% of responses came from women. Hence, this is largely men answering a question about if there were services available for women. It would be interesting to examine this in more detail by conducting secondary interviews with women to assess their beliefs in relation to my results.

There is a need for additional approaches – including preferences of the local community for improving the MPA management– for assessment of the management effectiveness of the MPA more comprehensively. The interests of communities are now included in the field of assessment theory and practices (e.g. Bryson *et al*., 2011; Alkin, 2004), in which preferences of local communities are linked to the success of an MPA (Himes, 2007).

5.7 Concluding remarks

Assessing satisfaction of diverse stakeholder groups with several specific criteria in relation to management of an MPA is a useful approach that can be used for the MEE of PAs, based on community's satisfaction, in depth. However, community's satisfaction alone is not sufficient because this broad criterion does not show, for example, other activities of the MA (Chapter 3), or preferences of the communities for improving the MPA management (assessed in Chapter 6). There is a need to triangulate with other approaches to assess management effectiveness of an MPA more comprehensively.

The results of this chapter on the management effectiveness of the Socotra Island MPA indicate that:

1. There are perceived conflicts between the decision makers of the MA about the management of the MPA;
2. There are perceptions of ineffectiveness for almost all MPA management criteria; and
3. Many respondents, particularly from the secondary user groups, may not have a consensus or clear knowledge about the management of the MPA.

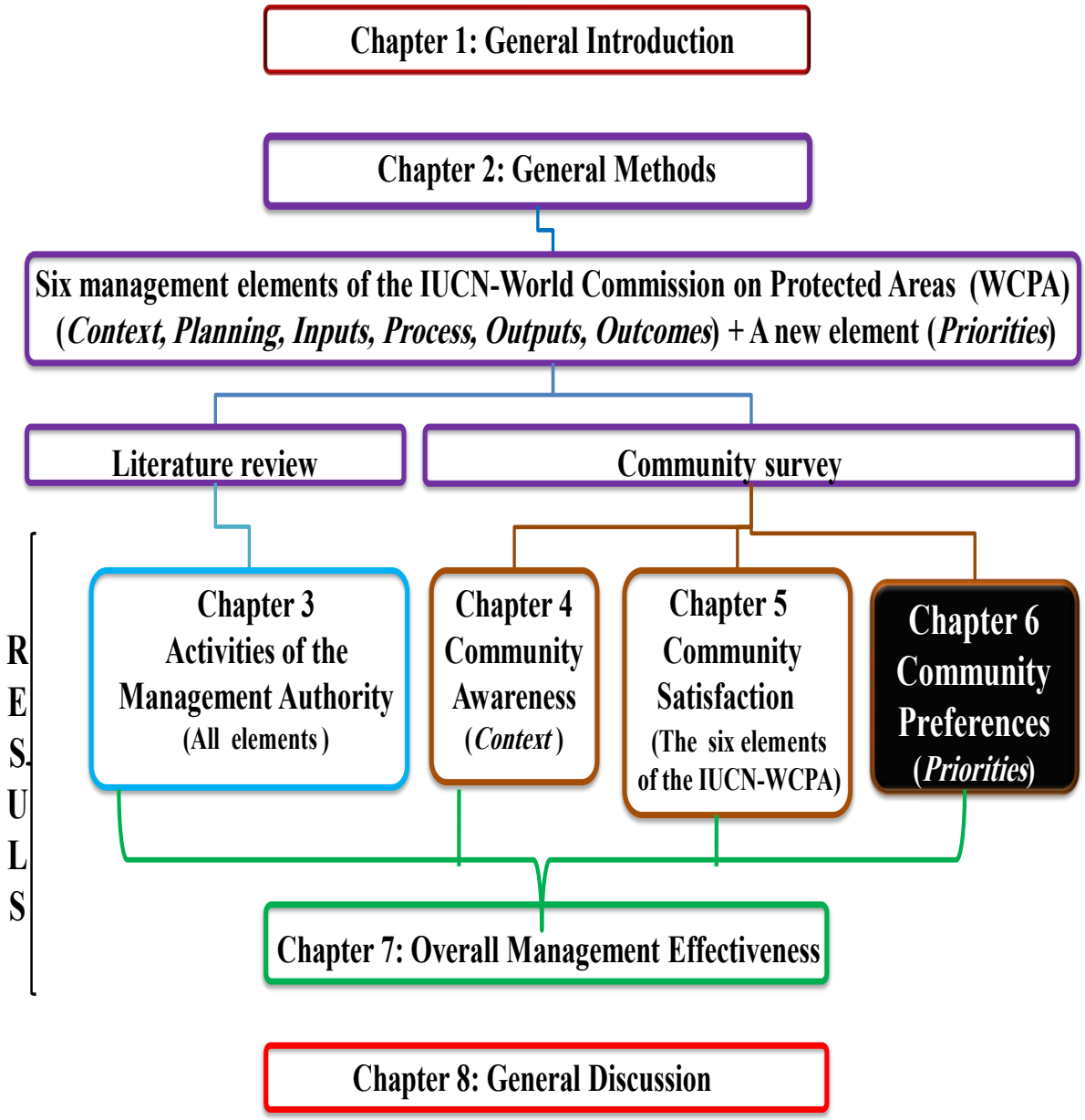
Recommendations to improve the effectiveness of management of the MPA include:

1. Involving a wide range of local stakeholders, particularly the Decision Maker Group, to investigate their views and expectations about the management of the MPA; and

2. Identifying the type of problems and conflicts within community subgroups in relation to the MPA management. Once conflicts are identified, the MA can focus on having solutions through further discussions, evaluating the effects of alternative management measures, and sharing this information with these subgroups (Oikonomouand Dikou, 2008).

Whilst it could be difficult to meet the satisfaction of a wide array of stakeholders with many criteria of MPA management, it is worth mitigating negative attitudes, particularly for the Decision Maker Group, to improve MPA success. Considering the above two recommendations could increase the management effectiveness of the MPA.

Chapter 6: Community Preferences for Improving the Socotra Island Marine Protected Area Management



6.1 Abstract

Communities' preferences for improving the management of MPAs are recognised as an important component in managing these areas and should be considered when assessing MPA effectiveness. However, there is still a gap in knowledge as to how such effectiveness can be assessed.. In this chapter, investigating whether a community's preferences for improving MPA management were aligned with priorities set by a government was used as an approach to assess the management effectiveness of the Socotra Island MPA. Indicators were used to explore this alignment via a community survey from diverse local Socotran and Yemeni Non-Socotran stakeholders living on Socotra Island. These indicators were related to a management element '*Priorities*' I developed in this thesis. It was found that the local community's preferences for improving the MPA management were not in line with the Yemeni government's priorities. The management effectiveness of the MPA was assessed as low. The results suggested there was problematic communication between the Yemeni government and the local community towards the future management of the MPA. The approach used in this chapter provided a thorough understanding of how effectively an MPA is managed in terms of management sustainability for this area. It is suggested to be considered in assessing management effectiveness of MPAs.

6.2 Introduction

An important component in managing MPAs is determining communities' preferences for improving MPA management, as this is an essential key for their effectiveness (e.g. Himes, 2007). Failure to consider the community's input, needs and preferences is a significant problem in thinking or for taking appropriate actions, leading to poor management, outright failure, or even crisis (Bryson, 2004). Many studies have shown that a community's input is critical in increasing stakeholder support for the management process, developing objectives of an MPA, identifying appropriate management actions and is ultimately critical to management effectiveness (Pomeroy *et al.*, 2004; Suman *et al*., 1999). If governments are to achieve these objectives, they may need to consider communities' input in managing an

MPA (Wadsworth *et al.*, 2014). However, local communities may often prefer factors (such as marine resource extraction) that are in conflict with MPA objectives. Therefore, managers need to enhance awareness raising programs for these communities and discuss with them other alternatives needed to mitigate factors affecting effectiveness of MPA management.

MPA management has generally been judged by the ability of the area to increase organism biomass and diversity (Himes, 2007). It is rarely assessed according to the ability of a government to meet the social, cultural and economic preferences of the local community living adjacent to an MPA (Russ and Alcala, 1999; Harmelin *et al*., 1995).It could be important for researchers to investigate, and governments to consider, what communities living adjacent to MPAs prefer for improving management of these areas. Equally importantly is a need to understand whether governments value communities' preferences for managing an MPA. Indeed, previous researchers have highlighted the significance of involving communities in the assessment of MPA management, using measures of the quality of the communication between governments and communities as an indicator (Hockings *et al.*, 2006). By comparing community preferences for improving an MPA's management with the management priorities established by governments, it is possible to understand management sustainability. Few studies (e.g. Islam *et al.*, 2014; Heck *et al.*, 2011; McClanahan *et al.*, 2009; Himes, 2007; Suman *et al*., 1999) consider the alignment of government and community preferences for how particular MPAs are managed or the criteria for their evaluation anddetailed approaches to consider this alignment are not well defined. To the best of my knowledge no study on MPA evaluation has included communities' preferences when assessing the management effectiveness of an MPA.

There are two likely reasons for not including the community's preferences for improving an MPA's management in the MEE of an MPA. First, it could be due to lack of a pertinent international framework or a method that enables it as an approach in the assessment. One approach, the IUCN-WCPA Evaluation Framework (Hockings *et al.*, 2006; 2000), is an international common evaluation strategy (Leverington *et. al.,* 2010). This framework includes six management elements (*Context, Planning, Process, Inputs, Outputs* and *Outcomes*) for the MEE of PAS, but not *'Priorities'*. Another approach, the *WB Scorecard*

Tool (Staub and Hatziolos, 2004) is an international method that is based on the IUCN-WCPA Evaluation Framework. This tool uses a community's awareness of threats (see Chapter 4) and stakeholder's satisfactions with inputs and outputs (see Chapter 5) as broad criteria for assessing management effectiveness of MPAs. However, the *WB Scorecard Tool* (Staub and Hatziolos, 2004) does not consider local community's preferences for improving an MPA management or highlight differences between diverse stakeholders. Second, investigating the alignment between the priorities set by a government and the community's preferences for improving an MA management could take considerable time and resources to achieve. Indeed, as I discussed in Chapter 1, time and budget could be obstacles in assessing management effectiveness of PAs, including MPAs, especially for a large MPA system such as Socotra Island. Thus, there is a need for developing approaches if researchers are to progress with management effectiveness assessment of an MPA.

Investigating whether a community's preferences for improving an MPA management are aligned with priorities set by a government was used as an approach in this chapter to assess the management effectiveness of the Socotra Island MPA. This aspect of my assessment is related to a new management element '*Priorities*' developed in this thesis. The approach is developed to improve understanding of how effectively the MPA is managed in terms of community engagement. Developing the approach permits the assessment of the MPA's effectiveness in terms of aligning priorities set by the Yemeni government with the local community's preferences for improving the MPA management; assessment of the differences in the local community's preferences for improving this management; and indicates the communication gaps between the government and stakeholders. This chapter aims to explore the validity of this approach and answers the questions outlined below.

6.3 Aims

This chapter addresses the fourth research question of this thesis: "*Are the priorities set by the Yemeni government aligned with the local community's preferences for improving the Socotra Island MPA management?*" Specifically, it aims to answer the following questions:

- What does the local community and stakeholder groups believe is the most important criterion needed for improvement of the management of the MPA?
- Are the most frequent criteria cited by the local community, including stakeholder groups, in line with the Yemeni government's priorities for improving the MPA management?
- Are there differences within stakeholder groups in citing and ranking their preferences for improving the MPA management?
- What are the criteria ranked high, and agreed by stakeholder groups, for improving the MPA management and are they in line with the government's priorities?

6.4 Methods

6.4.1 Data collection

6.4.1.1 Survey questions

Two questions from the community survey, including open and closed-ended questions, are outlined below. They explore the preferences of the local community for improving the MPA management. This survey was based on a questionnaire and respondents were interviewed from local Socotrans (n=414) and Yemeni Non-Socotrans (n=66) living on Socotra Island (see Chapter 2). The rationale and coding of the two survey questions were as follows:

1. "*In your opinion, what is the most important criterion that should be considered for improvement of the management of the marine environment of the Socotra Island MPA in the future?"*This was an open-ended question to investigate whether preferences of the local community are in line with the four priorities set by the Yemeni Government (establishment of a new independent MA, legal framework development, legislation enforcement and zoning amendment), as highlighted in IUCN (2008), for improving the MPA management. Establishment of a new independent MA was the top priority (personal communication, 2011). For those who completed the survey via group-

administered interviews (see Chapter 2) and listed more than one criterion, the first written criterion was considered in the analysis. Responses were sorted into descriptive categories through inductive analysis (Patton, 2008). For example, the respondents who mentioned that the MA should involve people, locals or villagers, in management-related activities were sorted into community participation as an criterion in relation to '*Context*'.

2. *"In relation to the future management of the marine environment of Socotra Island how important is each of the following criteria to you?"*This was a closed-ended question to investigate levels of importance of 19 criteria for improving the MPA management. More than 19 management criteria were proposed for this question, but they were modified and reduced after discussing them with the most appropriate staff members of the MA and agreeing to those most suitable for the MPA evaluation. Pre-testing was conducted with some locals on Socotra Island to improve clarity of each criterion. The 19 management criteria were related to the 6management elements (*Context, Planning, Inputs, Process, Outputs* and *Outcomes*) (Chapter 2). These criteria included opportunity for participation in activities relating to the MPA management (*Context*), increased regulations (*Planning*), MA staff capacity enhancement (*Inputs*), regulation enforcement and research (*Process*), public services on the Island (*Outputs*), and livelihood development (*Outcomes*). The Yemeni government's priorities were included within the 19 criteria. Respondents were asked to choose one option on a 1–5 importance scale, where 1=Extremely Important; 2=Very Important; 3= Important; 4= Somewhat Important; and 5= Not Important. Respondents were also allowed to choose the option of 'Don't know/no opinion'.

6.4.1.2 Effectiveness assessment

The following four indicators were developed to assess effectiveness of the MPA management based on aligning priorities set by the Yemeni government with the community preferences for improving the MPA management:

1. Did the local community cite the government's top priority as an important criterion for improving the MPA management?

2. Did the majority of the local community cite one of the other government's priorities as an important criterion for the MPA management?
3. Did the local community rank the government's top priority as an extremely important criterion for improving the MPA management?
4. Did the majority of the local community rank one of the other government's priorities as an extremely important criterion for improving the MPA management?

6.4.2 Data analysis

6.4.2.1 Survey questions

Descriptive analyses were undertaken to explore responses for the above seven questions. As indicated in Section 2.3.1, Chapter 2, the Fisher's Exact Test for two-way contingency tables was used to test significance of differences in responses (in terms of proportion of respondents who chose or listed selected answers) within the four key community groups:

a) *Socotran Decision Maker Group*;
b) *Socotran Primary User Group*;
c) *Socotran Secondary User Group*; and
d) *Yemeni Non-Socotran Secondary User Group*.

Fisher's Exact Test was also used to test for significance differences in responses within the above four key groups (a–d), three key Socotran groups (groups a–c) and between the *Socotran Secondary User Group* (group c) and *Yemeni Non-Socotran Secondary User Group* (group d). The Kruskal-Wallis (*H*) test was used to test significance of differences in responses (scores) within the four key groups (a–d) and the three key Socotran groups (a–c). The Mann-Whitney (*Z*) test was applied for testing these differences between the *Socotran Secondary User Group* (group c) and *Yemeni Non-Socotran Secondary User Group* (group d).

6.4.2.2 Effectiveness management

Similar to the scoring system used by Staub and Hatziolos (2004) and in the previous Chapters 3, 4 and 5, each of the above four indicators was scored from 0 (Low), 1 (Moderate), 2(High) to 3(Very High) based on proportions of all respondents who cited and ranked the Yemeni government's priorities (see Table 6.1). The Final Score result of the management effectiveness of the MPA in relation to '*Priorities*' was calculated as a percentage following the same equation used in Chapters 3, 4 and 5, which is indicated below:

Final Score = (Total scores obtained/ Maximum scores of indicators) x 100.

In this chapter, the maximum score of the indicators in relation to '*Priorities*' was 12 (4 x 3). The Final Score for effectiveness was either categorised as Low (0%–25%), Moderate (>25%–50%), High (>50%–75%), or Very High (>75%). Ranks of Low and Moderate indicate inadequate effectiveness while High and Very High indicate effective management of the MPA in terms of community awareness and participation in relation to '*Priorities*'.

Table 6.1 The scoring system for indicators used to assess the management effectiveness of the Socotra Island MPA in terms of aligning Yemeni government's priorities with community preferences for improving it. Scores: 0 = Low; 1= Moderate; 2 = High; 3 = Very High.

Indicators and alternative responses	Scores
Indicator 1: Did the local community cite the government's top priority as an important criterion for improving the MPA management?	
Less than 26% of the local community cited the government's top priority as important for improving the MPA management.	0
From 26% to 50%of the local community cited the government's top priority as important criteria for improving the MPA management.	1
From 51% to 75% of the local community cited the government's top priority as important criteria for improving the MPA management.	2
More than 75% of the local community cited the government's top priority as important for improving the MPA management.	3
Indicator 2: Did the majority of the local community cite one of the government's other priorities as important for improving the MPA management?	
Less than 26% of the local community cited one of the government's other priorities as important for improving the MPA management.	0
From 26% to 50% of the local community cited one of the government's other priorities as important for improving the MPA management.	1
From 51% to 75% of the local community cited one of the government's other priorities as important for improving the MPA management.	2
More than 75% of the local community cited one of the government's other priorities as important for improving the MPA management.	3
Indicator 3: Did the local community rank the government's top priority as extremely important for improving the MPA management?	
Less than 26% of the local community ranked the government's top priority as extremely important for improving the MPA management.	0
From 25% to 50% of the local community ranked the government's top priority as extremely important criteria for improving the MPA management.	1
From 51% to 75% of the local community ranked the government's top priority as extremely important criteria for improving the MPA management.	2
More than 75% of the local community ranked the government's top priority as extremely important for improving the MPA management.	3
Indicator 4: Did the majority of the local community rank one of government's other priorities as a extremely important for improving the MPA management?	
Less than 26% the local community ranked one of government's other priorities as extremely important for improving the MPA management.	0
From 25% to 50%of the local community ranked one of government's other priorities as extremely important for improving the MPA management.	1
From 51% to 75% of the local community ranked one of government's other priorities as extremely important for improving the MPA management.	2
More than 75% of the local community ranked one of government's other priorities as extremely important for improving the MPA management.	3

6.5 Results

6.5.1 The most important management criteria (Survey Question 1)

6.5.1.1 All Respondents

Twenty-three criteria (including the Yemeni government's priorities: establishment of a new independent MA, zoning amendment, legal framework development, and legislation enforcement) were coded from responses to Survey Question 1 (an open-ended question) (see Table 6.2), but no more than seventeen percent of respondents cited the same criterion for improving the MPA management (Table 6.2). The most frequently cited criteria related to improvement of the MA's management (appropriate staff and organisation), followed by improvement of services available for the locals/fishers, local community involvement in management, development of awareness-raising programs, marine environment protection and fish/fisheries conservation. The other 18 management criteria, including the Yemeni government's priorities, were each mentioned by less than 3% of respondents. Therefore, no Yemeni government's priority was within one of the six top important criteria cited by respondents.

6.5.1.2 Stakeholder groups

Citation frequencies for each of the 23 criteria coded from Survey Question 1(an open-ended question) varied within the 4key stakeholder groups, but each group cited improvement of the MA's management as a criterion more frequently than other criteria (Table 6.2). Combined, these groups cited 13 other important criteria for improving the MPA management, including this criterion, local community's participation in management-related activities, improvement of the MA's facilities, enhancement of research/studies, vessel surveillance enhancement, improved services for fishers/locals, development of awareness programs, and improvement of public services. The *Socotran Secondary User Group* mentioned the Yemeni government's priorities, except regulation enforcement, as important criteria for improving the MPA management. In contrast, the *Yemeni Non-Socotran Secondary User Group* motioned this priority, but did not mention the Yemeni government's

top priority (establishment of a new independent MA), or the other two government priorities (legal framework devolvement and zoning amendment) as important criteria. None of the four priority criteria set by the Yemeni government is recorded within the top four frequent most criteria cited by a key community group for improving the MPA management (see Table 6.2).

There were statistically significant differences in citing five (establishment of a new independent MA, enhancement of research/studies, involvement of related authorities, services available for the fishers/locals and tourism development) of the 23 recorded management criteria within the key stakeholder groups for improving the MPA management (see Table 6.2). More respondents from the *Socotran Secondary User Group* preferred a new independent MA ($p = 0.006$) as an important criterion for improving the MPA management than respondents from the other key stakeholder groups ($p = 0.006$). More respondents from the Decision Maker Group preferred enhancement of research/studies and involvement of related authorities than those from the other groups ($p < 0.001$; $p = 0.002$ respectively). More respondents from the *Socotran Primary User Group* preferred services available for the locals/fishers than those from the other groups ($p < 0.001$). More respondents from the *Yemeni Non-Socotran Secondary User Group* preferred tourism development than those from the other groups ($p < 0.001$). In contrast, there was no statistically significant difference in the most frequently cited management criterion (improvement of the MA's management) within the four key stakeholder groups, the key Socotran groups or between the *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group*.

Table 6.2 The important criteria preferred by all respondents and key stakeholder groups for improving the Socotra Island MPA management (n=480, % of respondents) (Survey Question 1: "*In your opinion, what is the most important criterion that should be considered for improving the management of the marine environment of the Socotra Island MPA in the future?")*. Key stakeholder groups: A: *Socotran Decision Maker Group*; B: Primary Secondary User Group; C: *Socotran Secondary User Group*; D: *Yemeni Non-Socotran Secondary User Group*.

The important criteria	All	Key stakeholder groups			
		A (n=77)	B (n=120)	C (n=217)	D (n=58)
Context					
Local community participation	10	8	12	11	4
Planning					
*[ab]+New independent MA establishment	2	1	1	7	0
+Legal framework development	2	4	1	2	0
+MPA zoning development	1	4	1	1	0
Inputs					
Improvement of management by MA	16	14	16	15	19
Improvement of the MA facilities	2	4	1	3	4
Process					
*[a]Research/studies enhancement	2	8	1	2	2
*[a]Related authorities involvement	2	7	1	1	0
Vessels surveillance enhancement	2	4	1	3	2
+ Regulation enforcement	2	1	2	0	2
Outputs					
*[a]Services improvement for fishers/locals	10	4	15	7	7
Awareness programs development	9	14	9	5	9
Public services improvement	3	1	2	4	3
Education development for locals	2	1	1	4	2
*[b]Tourism development	2	0	1	2	7
Fisheries investment	1	0	1	0	3
Outcomes					
Marine environment protection	7	8	8	3	9
Fish/fisheries conservation	6	4	10	3	4
Livelihood improvement	5	3	5	6	4
Marine biodiversity conservation	3	0	3	5	2
Traditional practices conservation	1	1	1	2	2
Coral reefs conservation	1	0	1	2	0
Turtles protection	1	0	1	0	0
Lobsters protection	0	1	0	1	0
*Don't know/no opinion	*10*	*8*	*7*	*13*	*19*

*Statistically significant difference (SSD) within all four key stakeholder groups. [a]SSD within the three key Socotran groups. [b]SSD between *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group*. +: The Yemeni government's priorities.

6.5.2 Importance of different management criteria (Survey Question 2)

6.5.2.1 All respondents

Respondents were provided with the 19 management criteria (including the Yemeni government's priorities) and asked to choose one option on a 1–5 importance scale as shown in Section 6.4.1.1, for improving the MPA management (Survey Question 2) (Figure 6.1). Over 65% of respondents ranked six criteria as extremely important for improving the MPA: more services for fishers/locals (76%), mitigating threats affecting the MPA (75%), improvement of public services (73%), more awareness materials (72%), strengthening of Socotran roles in the MPA process (71%), and enhancement of MA staff capacity (66%). In contrast, less than 60% of all respondents ranked the four Yemeni government's priorities (zoning amendment (16%), establishment of a new independent MA (45%), more regulations (51%) and legislation enforcement (58%)) as extremely important criteria for improving the MPA management. Therefore, the respondents ranked more services for fishers/locals and mitigating threats affecting the MPA as extremely important more often than they ranked Yemeni government's priorities for improving the MPA management.

6.5.2.2 Stakeholder groups

There were statistically significant differences in ranking importance of the 19 criteria for improving the MPA management within the 4key stakeholder groups except for 5criteria(Figure 6.2): MA staff capacity enhancement (H= 5.943, p = 0.114); zoning amendment (H= 2.043, p = 0.564); strengthening of involvement of authorities (H= 3.782, p = 0.286); tourism development (H= 2.715, p = 0.438); and strengthening the empowerment of women (H= 0.313, p = 0.958). The *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group* differed in ranking the importance of five criteria for improving of the MPA management: fewer regulations (Z = -2.475, p=0.013); strengthening of the Socotran role in the MPA process (Z = -2.816, p = 0.005); and fisheries investment (Z = -2.105, p = 0.035).

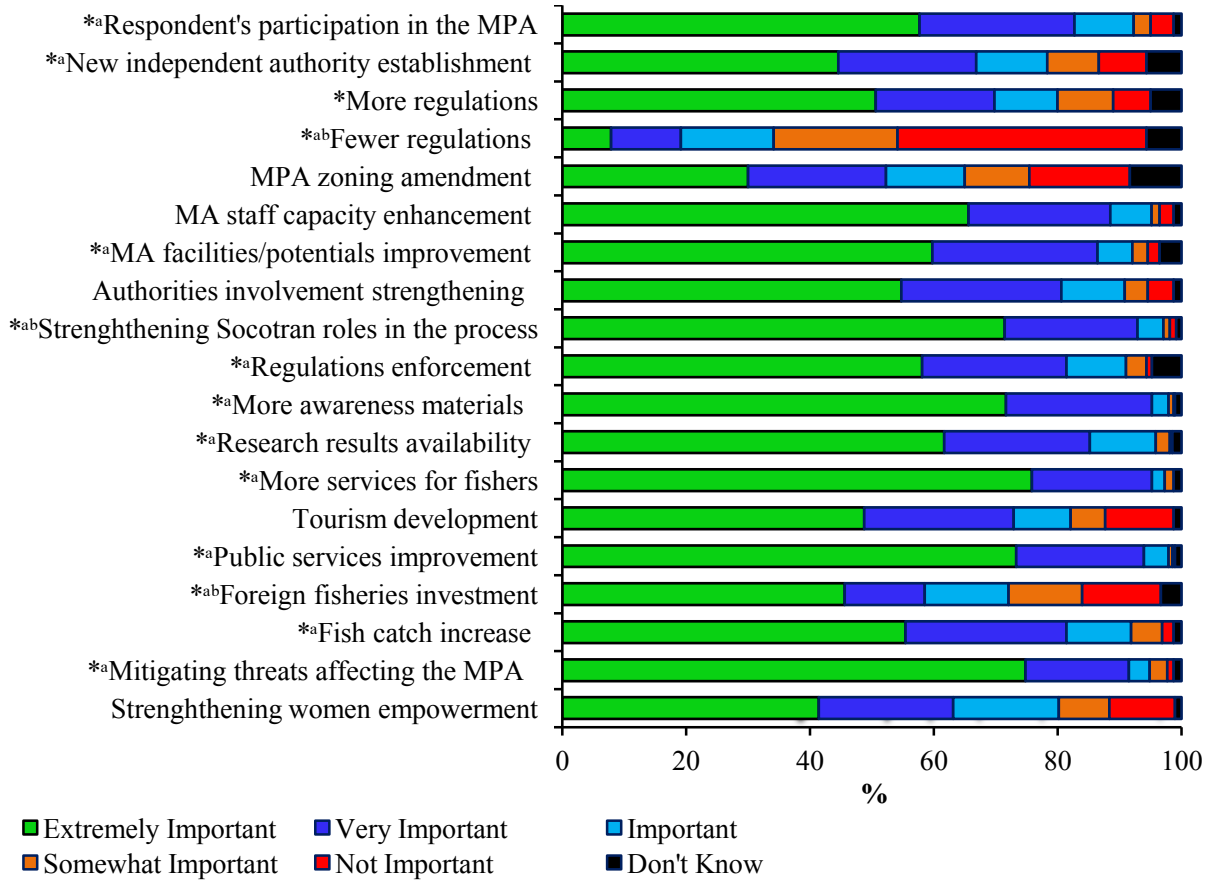
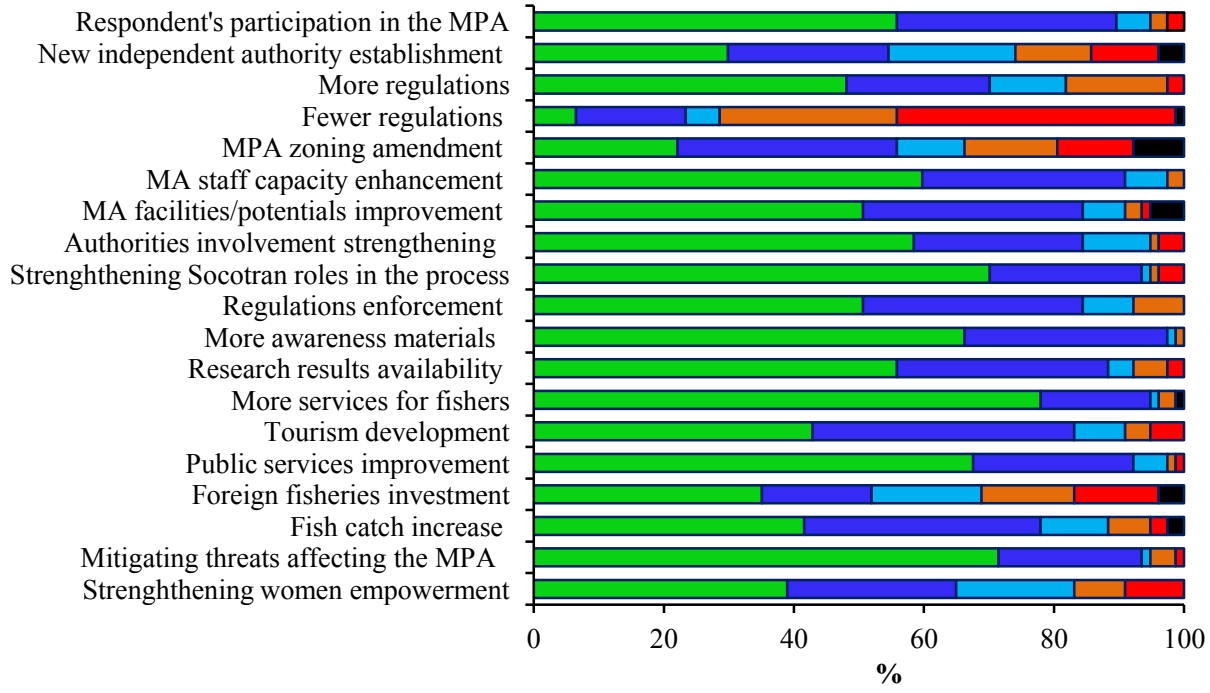


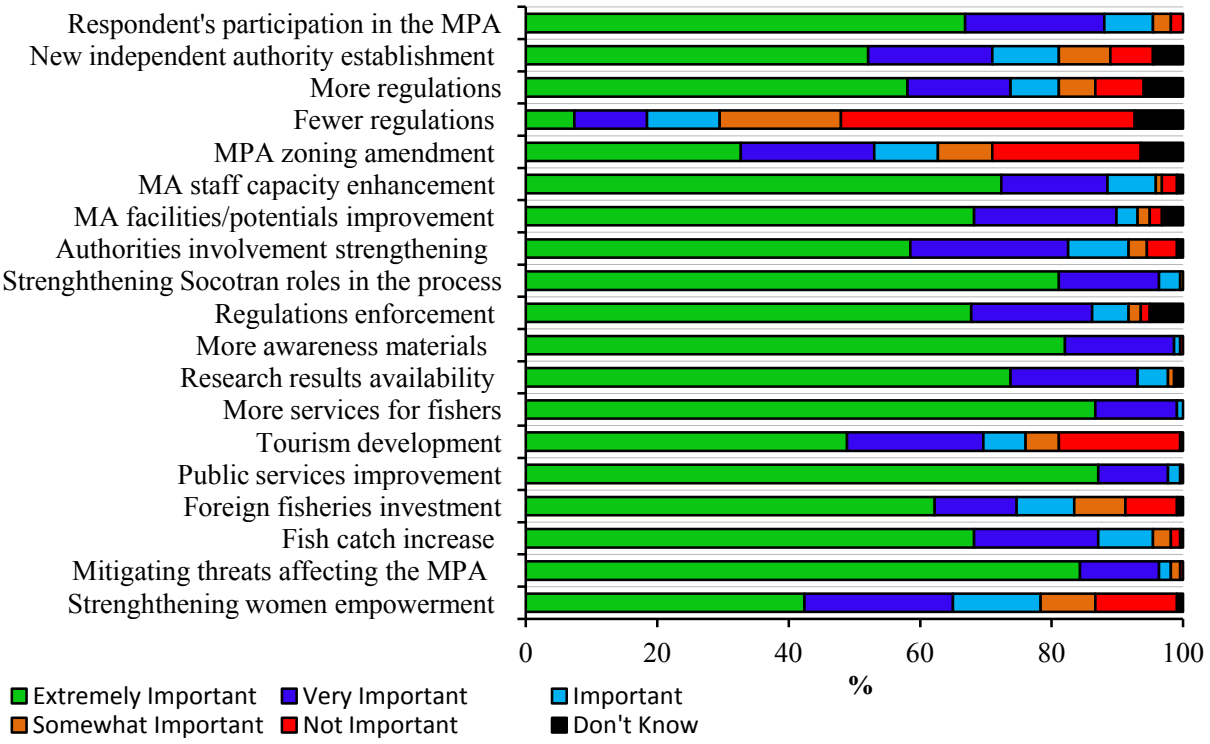
Figure 6.1 Importance of 19 criteria ranked by all respondents for improving the Socotra Island MPA management (% of respondents, n= 480) (Survey Question 2*: "In relation to the futuremanagement of the marine environment of Socotra Island how important is each of the following criteria to you?").*Statistically significant difference(SSD) within *Socotran Decision Maker Group*, *Socotran Primary User Group*, *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group*. [a]SSD within these three Socotran groups. [b]SSD between *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group*.

All four key stakeholder groups ranked the enhancement of MA staff capacity as an extremely important criterion and cited it much more frequently than zoning amendment, tourism development, strengthening of women empowerment, or strengthening involvement of authorities (Figure 6.2). Therefore, enhancement of the MA staff capacity was the criterion ranked high and agreed by all key stakeholder groups for improving the MPA management.

Socotran Decision Maker Group (n=77)



Socotran Primary User Group (n=217)



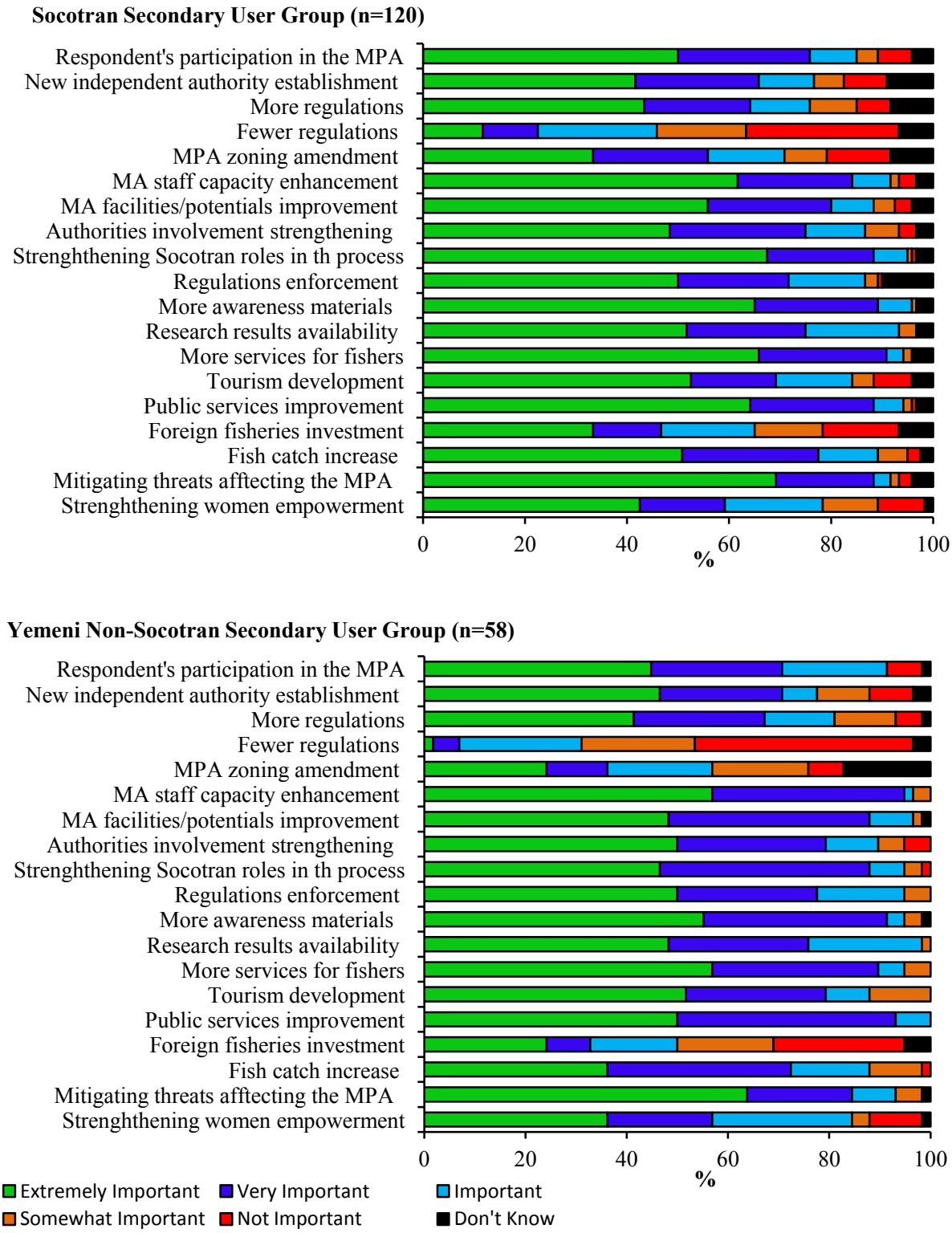


Figure 6.2 Importance of 19 criteria ranked by each key stakeholder group for improving the Socotra Island MPA management (% of respondents) (Survey Question 2*: "In relation to the futuremanagement of the marine environment of Socotra Island how important is each of the following criteria to you?").*

6.5.3 Management effectiveness of the MPA

The scores of the four indicators used to assess the effectiveness of the MPA's management priorities varied from 0 (Low) to 2 (Moderate) (Table 6.3). The highest score obtained was for one of the Yemeni government's priorities ranked as extremely important by the majority of the local community respondents (Indicator 4). The lowest scores were obtained government's top priority, which was cited by the local community (Indicator 1), and another government priority that was cited by the majority of the local community (Indicator 2) as important for improving the MPA management. The Final Score (25%) obtained indicates low alignment between the Yemeni government's priorities and community's preferences for improving the MPA management.

Table 6.3 Scores of indicators used to assess the management effectiveness of the Socotra Island MPA in terms of aligning Yemeni government's priorities with community preferences for improving it (% of respondents, n= 480). Scores: 0= Low; 1=Moderate; 2: High; 3=Very High.

Indicators	%	Score
Indicator 1: The local community cited the government's top priority as an important criterion for improving the MPA management.	2	0
Indicator 2: Most of the local community cited another government priority as an important criterion for improving the MPA management.	2	0
Indicator 3: The local community ranked the government's top priority as an extremely important criterion for improving the MPA management.	45	1
Indicator 4: Most of the local community ranked another government priority as an extremely important criterion for improving the MPA management.	58	2

6.6 Discussion

6.6.1 Overall discussion

Results from this chapter show that the effectiveness of the Socotra Island MPA management is low. Essentially this is partly because of low alignment of the priorities set by the Yemeni government with the community's preferences for improving its management, thus indicating the MPA had inadequate management in relation to '*Priorities*' (a new management element created in this thesis). Importantly, the community identified other management priorities,

such as improvement of the MA management and services available for fishers/locals, as necessary for improving the MPA management. This suggests that the effectiveness of the management priorities of the MPA could be substantially improved.

For improvement of MPA management, resource user groups and MAs should agree on the proposed priority actions and work collaboratively toward their implementation (McClanahan *et al.*, 2009). If MAs collaborate more closely with the community on setting priority actions with different local resource users for management of the MPA, then managers could explore which strategies were more important than others and management of the MPA could be improved. If a MA considers and agrees with the users (and vice versa) on the priorities, it is more likely to avoid differences between preferences for improving an MPA management and future conflicts in its implementation.

6.6.2 Management priorities

6.6.2.1 The local community

Results from this chapter indicate that the priorities set by the Yemeni government for improving the MPA were not in line with the preferences of the local community, even when the respondents were given specific "Government" priorities to rank. The local community mostly preferred management improvement of the current MA. In contrast, the government considered the establishment of a new independent MA (the Socotra Development Authority (SDA)) as a top priority to have more power and improved potential to manage Socotra Island in general, not just the MPA. The majority of the local community may not be aware of such a vision or they could perceive that a new independent authority is not an extremely important criterion for managing the MPA more successfully.

The other three government priorities (legal framework devolvement, enforcement and zoning amendment) were also not in line with the top three criteria cited (improvement of services available for the fishers/locals, local community involvement in management and raising awareness program development) or ranked as extremely important (mitigating threats affecting the MPA, public service improvement and more awareness materials) by the

local community for improving the MPA management. The local community did not perceive these government criteria as high priorities to manage the MPA more successfully. They may believe that the MPA has an adequate legal basis and creating more strict regulations or enforcement could have an impact on their access to the MPA or it could be that such areas of management are beyond the direct experience or knowledge of the community. In particular, they are likely not aware of the legal framework of the MPA. Clearly, improved community involvement at all levels of management could lessen the gaps between government and community priorities and create a more transparent decision making process.

Although there was community involvement in management-related activities in relation to the MPA, it seems that there were no consultative meetings or agreements with a wide range of the coastal local stakeholder groups, especially the *Yemeni Non-Socotran Secondary User Group*, on the Yemeni government's vision for its management. In 2010, the MA held a consultative workshop with stakeholders, including donors, in the capital of Yemen on the government's priorities— particularly on the establishment of the SDA—for improving the MPA management (http://www.socotraproject.org/index.php?page=content&id=18). This suggests that the government had shared their vision for the future MPA management with certain stakeholders, in and out of Socotra Island, but did not consider local communities from remote areas. Yet, in the data presented in this chapter only 11 (out of 480) respondents cited a management criterion consistent with the government's top priority and only a small number ofrespondents mentioned the government's other priorities for improvement of the MPA management. Surprisingly, no respondent from the *Socotran Secondary User Group* cited the enforcement criterion (which is the government's priority) for improving the MPA management. One of the most notable results from this study was that no respondent from the *Yemeni Non-Socotran Secondary User Group* elicited the government's priorities except for enforcement. This could indicate that this group had their own list of priority actions or were not involved in consultative workshops.

Improvement of the MA's management (appropriate staff and organisation) was the most frequent criterion cited and agreed by the key local stakeholder groups for improving the MPA management. This result suggests that these groups perceived the current MA structure

as not suitable. The possible reason for this result is that the MA in Socotra Island lacks national professional staff in marine ecology, especially in socioeconomic areas (personal observation, 2011), and has ineffective coordination with other local authorities in Socotra Island, including the Office of Ministry of Fish Wealth (Chapter 3).

The differences I found between the priorities set by the Yemeni government and the local community's preferences are not uncommon in evaluation of MPA success. Similar differences were reported for the Egadi Islands Marine Reserve (EIMR) in Italy: local residents near the EIMR considered decreasing pollution as the primary target while managers prioritised increasing the level of tourism (Himes, 2007). Similarly, in the Florida Keys National Marine Sanctuary (FKNMS) in the United States of America, Suman *et al.* (1999) found that many people did not prefer the extension of a "no-take" zone as proposed by the National Oceanic and Atmospheric Administration in the draft management plan developed for the FKNMS. It is clear that local communities have different perceptions about management priorities to managers of MPAs.

6.6.2.2 Stakeholder groups

A noteworthy finding from this chapter is that the majority of the four key stakeholder groups (*Socotran Decision Maker Group*, *Socotran Primary User Group*, *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group*) agreed that enhancing the MA staff capacity is an extremely important criterion for improving the MPA management. The key stakeholder groups also believed that the effective management of the MPA is beyond the current capacity of the MA staff. Such a result was similar to the most frequently cited criterion (improvement of the MA's management) and agreed by the local community for improving the MPA management. Such a finding was similar to 17 MPAs in Thailand, where local stakeholders perceived that the inability to manage these areas was attributed to lack of capacity within MAs (Bennett and Dearden, 2014b).

The results in this chapter highlighted differences in citing some preferences in relation to environmental and socioeconomic criteria within the four key stakeholder groups for improving the MPA management, suggesting that they had their own consideration or needs based on their own connection with the MPA. For example, the *Socotran Decision Maker*

Group considered enhancement of studies/research in relation to the MPA higher than the other key groups. This group may perceive that the MPA is more inadequate because the *Socotran Decision Maker Group* is likely to be more aware of its management than the other three stakeholder groups. The *Socotran Primary User Group* considered the need to improve services available for fishers/locals as a very important management criterion, compared with the other key groups.

Most of respondents from this group were *Fishers* (see Chapter 2) and such services are still inadequate on Socotra Island (Chapter 3; personal observation, 2011). In contrast, the *Yemeni Non-Socotran Secondary User Group* preferred tourism development, compared with the other key Socotran groups, for securing the future of the MPA. This possibly indicates that the *Yemeni Non-Socotran Secondary User Group* has broader economic interests in the MPA because almost all local Non-Yemeni Socotrans came to work on Socotra Island.

The differences I found in preferences towards management of the MPA between stakeholder groups are not uncommon. Such differences were found for management of the Perhentian Marine Park in Malaysia, where fishers mostly preferred activities that increase fish biomass while other groups (local residents and traders/shop owners) mostly preferred micro-credit investments to increase their incomes (Islam *et al.,* 2014). Similarly, Heck *et al*. (2011) found clear differences in preferences between user groups, who placed a higher importance on economic benefits, and non-user groups, who placed a higher importance on environmental improvements, for performance of the Pacific Rim National Park Reserve in Canada. McClanahan *et al.* (2009) also found villagers and government officials differed most in their preferences towards area–based management, spatial, temporal and special closures, and species restrictions for management of the Mafia Island Marine Park in Tanzania.

Another finding from this chapter is that differences between the priorities set by the Yemeni government and the community's preferences for improving the MPA management could negatively affect the overall potential of obtaining a successful MPA. It would be difficult to weigh preferences of one key community group more than another, especially when preferences of a secondary user group are significantly different from the others. This

becomes more complicated when a community's preferences for improving the MPA management and the MA's objectives are in conflict (Himes, 2007).

The likely reasons for differences in the management preferences within the stakeholder groups include differences in the perceived benefits gained from the MPA and the socioeconomic status of respondents. Previous studies investigated the correlation of such factors with preferences of respondents concerning a MPA. McClanahan *et al.* (2009) found that perceptions of benefits from the Mafia Island Park in Kenya were weakly correlated with the socioeconomic status of local villagers, but more strongly with whether people lived inside or outside the Park and their family's economic options. Marshall *et al.* (2009) reported that the socioeconomic characteristics of the Salum region in Egypt are conducive to implementation of MPAs as long as their implementation is characterised by considered design and effective involvement with local communities.

6.6.3 Implications of the approach

6.6.3.1 Strengths and challenges

The approach used in this chapter to investigate effectiveness of the MPA management in relation to the community's preferences provided useful insights into the quality of the communication between stakeholders and the MA. These insights are useful because they show the difference between government priorities and community preferences for improving the MPA management. The mismatching of these priorities with these preferences as shown in this chapter indicates that there was poor communication between the MA and the local community for management of the MPA to occur effectively. However, this mismatching may continue regardless of the level of communities. For example, the community groups may have different values regardless of the level of communication. The approach also added new understanding regarding the similarities and differences in needs, interests, and importance of management criteria between stakeholder groups.

The four indicators used to assess effectiveness of the management for the MPA gave a good indication of the quality of the relationship between the local community and the MA. If an

each indicator obtained a high score (at least 2) it gave an indication that the MA had consultations and agreements with the local community on the government's priorities for improving the MPA and vice versa. However, such an approach is not sufficient to asses management effectiveness of the MPA because it does not show the extent to which the MA complies with other management standards (e.g. planning) or whether the MPA achieves its management goals (outcomes).

There was a challenge associated with the data collected for the open-ended question survey (Question 1). There is a possibility that some survey respondents may not have fully understood the distinction between a management objective and a management criterion considered for improving the MPA management. For example, a fisherman responded to Question 1 as: "the environment office [MA] should combat the illegal big boats operating in the sea", as a management objective, rather than a management criterion such as legislation development, legislation enforcement, surveillance enhancement or fish protection. This could indicate that he did not comprehend the difference between them. Such a result may lead to confusion over the extent to which both processes and outcomes can be viewed as management criteria of success. Nonetheless, the data collected from Question 1 still provides important insight into community preferences as a whole.

6.6.3.2 Further studies

An important direction of future research would be to further develop the range of indicators used to assess management effectiveness of the MPA from the perspective of local communities. Such indicators could relate to management criteria addressed in this study. For example, is the most important criterion identified by a secondary community group in line with the top priority set by the government for improving the MPA management? This may give deeper insight into the quality of the relationship between the secondary community and the MA.

I recommend investigating the correlation of socioeconomic factors (such as income and resource dependency) with preferences of local communities for management improvement

of an MPA. This could give an even clearer picture of MPA effectiveness from different perspectives.

There is a need to link results of the approach used in this thesis to other approaches to assess management effectiveness of an MPA. The six management elements (*Context, Planning, Inputs, Process, Outputs* and *Outcomes*) of the IUCN-WCPA Evaluation Framework (Hockings *et al.*, 2006; 2000) are now addressed in the field of assessment theory and practices for protected areas (e.g. Heck *et al*., 2012; Leverington *et. al.,* 2010; 2008b). Results from this chapter could be more valuable if they were linked with results of these above-mentioned elements to evaluate effectiveness of the MPA.

6.7 Concluding remarks

Using community preferences for improving MPA management as an approach for the MEE of the Socotra Island MPA provides a thorough understanding on the quality of the communication between a government and stakeholders in managing this area. However, there is a need to consider this approach in relation to '*Priorities*', and the results with other approaches assessing criteria in relation to the other six management elements of the IUCN-WCPA Evaluation Framework (Hockings *et al*., 2006; 2000). Additional approaches assessing activities of the MA and awareness and satisfaction of the local community relating to an MPA—within these elements—could be valuable to assess its management effectiveness more comprehensively.

The results of this chapter on the management effectiveness of the Socotra Island MPA indicate that:

1. There is a mismatch between preferences of the Yemeni government and local community for the future management of the MPA and this difference is likely to lead to challenges in the government achieving the objectives of the MPA;
2. There are some differences in preferences between the key stakeholder groups for improving the MPA, which could be difficult for managers to weigh the needs of different communities living on Socotra Island; and

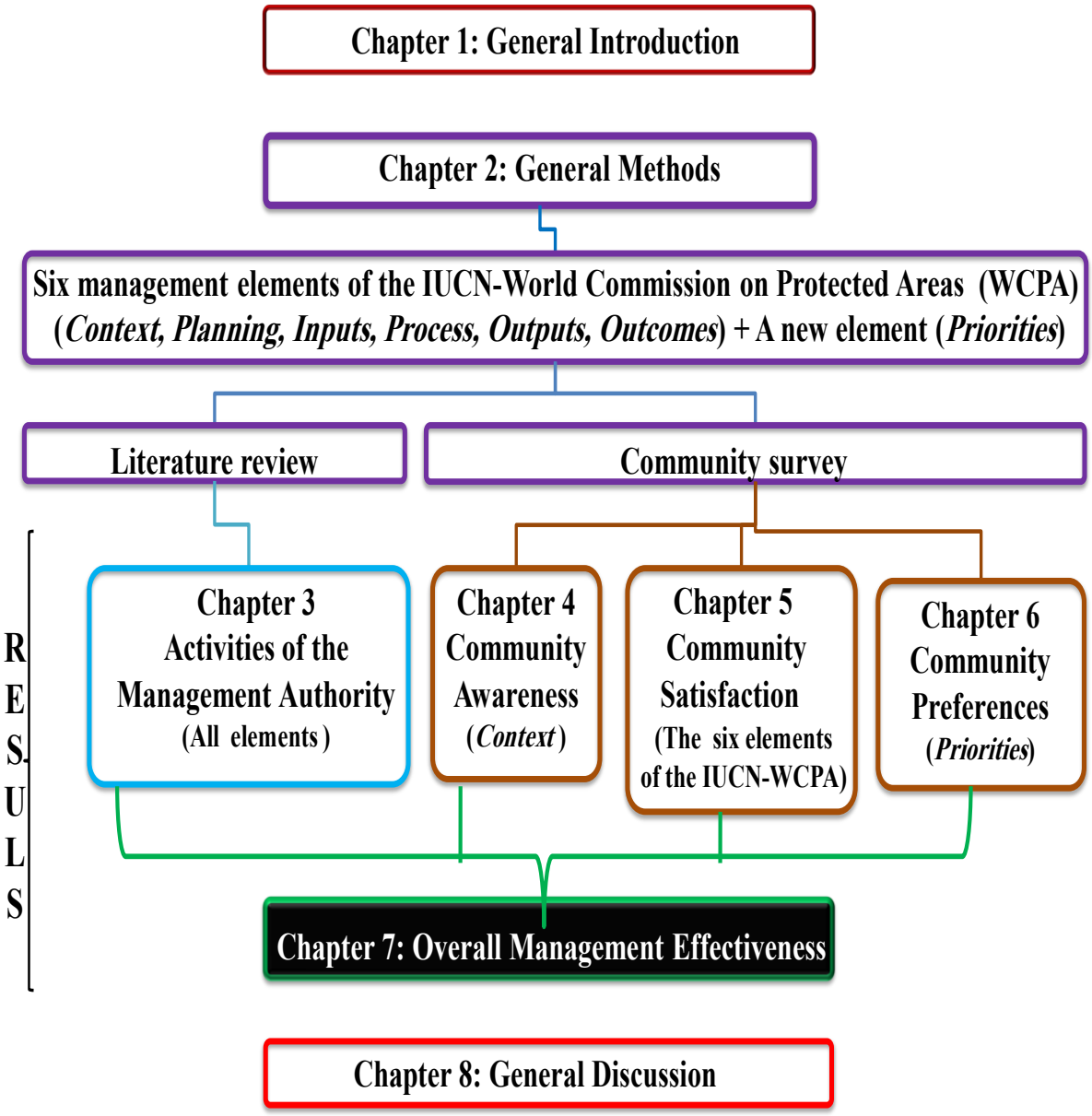
3. Preferences of the *Yemeni Non-Socotran Secondary User Group* for improvement of the MPA were not effectively considered in the MPA management.

Recommendations to improve effectiveness of management priorities of the MPA include:

1. Involving a wider range of the local community, including *Socotran Primary User Group*, in investigations of management problems and community needs on a regular basis; and
2. Identifying common preferences within local community and stakeholders after conflicts are made apparent. This could help the MA to set key priority areas of management to concentrate on, as well as comprehensively understand the fundamental interests of stakeholders. This is an important step in designing MPA management strategic priorities that may lead to stakeholders accepting the strategies, thus leading to effective MPA management (Himes, 2007).

While it could be difficult to meet all of the preferences of a wide array of local stakeholder groups, it is worth including the community in the management of the MPA to mitigate conflicts between local stakeholder groups and with the government about management of the MPA in the future. Considering such recommendations could increase the management effectiveness of the Socotra Island MPA.

Chapter 7: The Overall Effectiveness of the Socotra Island Marine Protected Area Management



7. 1 Abstract

The need to assess management effectiveness of PAs, including MPAs, has been internationally recognised internationally since the 1990s. The IUCN-WCPA developed an international evaluation framework for assessing management effectiveness of PAs. It includes criteria within six management elements (*Context, Planning, Inputs, Process, Outputs* and *Outcomes*). Many MPAs assessment methods have been developed based on this framework, but there is no an internationally accepted method. Researchers have recommended using several approaches to assess the effectiveness of MPAs. In this chapter, I used the IUCN-WCPA's six elements plus an additional element, called '*Priorities*' to assess the overall management effectiveness of the Socotra Island MPA. Seventy-two indicators were used for this assessment via a literature review and a comprehensive community survey in relation to these elements as a mixed-approach method. Forty-three indicators were used to measure activities conducted by the MA for the MPA management. Twenty-nine indicators were used to explore the community's awareness of several management criteria; participation in management-related activities; satisfaction with many management criteria; and preferences for improving the MPA management of diverse local Socotran and Yemeni Non-Socotran stakeholders. Based on indicators for all seven elements, the overall effectiveness of the MPA management was assessed as inadequate. The mixed-approach method provided a thorough understanding of how effectively the MPA is managed. It is suggested to be considered to assess management effectiveness of an MPA as a comprehensive evaluation strategy.

7. 2 Introduction

The need for the MEE of PAs, including MPAs, has been internationally recognised since the 1990s, because many of these areas failed to achieve their management objectives (e.g. Burke *et al.*, 2011, see Chapter 1). As discussed in Chapter 1, MPAs are considered important tools for the conservation of marine biodiversity and for people living in, or adjacent to, these areas. For example, multiple-use MPAs can provide food, resources and

livelihood for many coastal communities (e.g. Caveen *et al.*, 2013). However, in coastal zones within MPAs many managers do not have enough information to make appropriate decisions to achieve MPA objectives, including marine biodiversity conservation, successfully (e.g. Hockings *et al.,* 2009). Assessing the effectiveness of MPAs could prove useful for managers, enabling them to make better decisions with regard to improving MPA management. In addition, collecting information through a comprehensive assessment could allow managers to thoroughly understand the management status of MPAs and any potential issues impeding success. Therefore, there is a need for a method that can assess the barriers to, and opportunities for, successful MPA management and provide a comprehensive assessment of MPA governance.

A series of criteria, represented by carefully selected indicators, are generally used for the MEE of PAs, including MPAs (Worboys, 2007; Hockings *et al*., 2006). Since the 2000s, indicators have been adopted worldwide to assess MPA effectiveness. As described in Chapter 1, the IUCN-WCPA developed an international evaluation framework (Hockings *et al.*, 2006; 2000) for the MEE of PAs, including MPAs. This framework includes criteria in relation to six management elements (*Context, Planning, Inputs, Process, Outputs* and *Outcome*s) (Chapter 1). Several methods have been developed to assess management effectiveness of MPAs using indicators against criteria in relation to these elements, but there is no internationally accepted method for such assessment (Leverington *et al.*, 2010; 2008b; Chape *et al.*, 2005).

As outlined in Chapter 1, researchers suggest adapting a combination of different approaches for the MEE of an MPA. These approaches can include evaluation of key standard activities conducted by MAs, such as a management plan; an education and awareness program; monitoring programs for marine resources; and stakeholder assessments. Dahl-Tacconi (2007; 2005) suggests that combining several approaches to assess effectiveness is better than adopting a single approach in order to have adequate information on such an assessment. Day *et al.* (2003) also highlight this combination as a best scenario for measuring effectiveness of MPAs because it provides a balanced view on how such an area is managed. To date, developing approaches for assessing management effectiveness of PAs, including terrestrial and marine PAs, is still in an early stage (Addison *et al.*, 2015). Therefore, there is

a need for researchers to continue adopting and developing approaches to assess the management effectiveness of MPAs, with the determination of the applicability of such approaches being a contribution to the current available literature.

In Chapters 3–6, I used several approaches to undertake a robust MEE of the Socotra Island MPA in relation to the seven management elements (the six elements of the IUCN-WCPA Evaluation Framework (Hockings *et al*., 2006; 2000) and the additional element (*Priorities*) I developed in this thesis). These approaches included a literature review (Chapter 3) and a community survey in relation to diverse stakeholders' awareness of different management criteria and participation in management-related activities (Chapter 4); satisfaction with the MPA management (Chapter 5) and preferences for improving the MPA management (Chapter 6). In this chapter, I combine these approaches in relation to the seven elements to assess the overall management effectiveness of the Socotra Island MPA. Such a combination as a mix-approach method could provide a thorough understanding on how the MPA is managed. In this chapter, I investigate the applicability of this mixed-approach method.

7. 3 Aims

This chapter addresses the fifth research question of this thesis "*How effective is the overall management of the Socotra Island MPA in terms of management activities of the MA and community's awareness, participation, satisfaction and preferences?*" Specifically, it aims to answer the following key questions:

- Has the assessment via the literature review had the same result as the assessment via the community survey in relation to management elements?
- What is the most adequate management element overall in relation to the MPA?
- How effective is the MPA management in terms of the literature review and community survey?

7. 4 Methods

7.4.1 Data collection

In this chapter the scores obtained for the 72indicators recorded via the literature review (Chapter 3), the community survey (Chapters 4, 5 and 6) were used to assess the overall effectiveness of the MPA management. These indicators related to seven management elements. Six elements (*Context, Planning, Inputs, Process, Outputs* and *Outcomes*) are addressed in the IUCN-WPCA Evaluation Framework (Hockings *et al.*, 2006; 2000) and the additional element, titled *'Priorities*', which I developed in Chapters 3 and 6. From the literature review, 43 indicators were used to assess the management effectiveness of the MPA in terms of the MA activities conducted in relation to these seven elements (see Table 3.3, Chapter 3). From the community survey and in relation to these elements, 29 indicators were used to explore: the local community's awareness and participation relating to the MPA management within '*Context*' (seven indicators, see Table 4.3,Chapter 4); the community's satisfaction with criteria relating to MPA management within the six IUCN-WCPA's elements (18 indicators, see Table 5.3, Chapter 5); and the alignment between the community preferences for improving the MPA management and priorities set by the Yemeni government in relation to '*Priorities'* (four indicators, see Table 6.3, Chapter 6).This survey was based on a structured questionnaire and respondents were from different local stakeholder groups which included Socotrans (n=414) and Yemeni Non-Socotrans (n=66) (see Chapter 2).

7.4.2 Data analysis

Similar to the scoring system used by Staub and Hatziolos (2004) and as described in the previous Chapters (3, 4,5and 6) each indicator was scored 0 (Low), 1 (Moderate), 2 (High) or 3 (Very High). Table 3.1 and Table 4.1 show examples of indicators scored based on the literature review and questionnaire, respectively. Also, similar to these chapters, the maximum score of all indicators in this chapter/thesis was 213, which was calculated by multiplying the total number of indicators (72) by the maximum score of the indicator (3) used in this thesis. The Final Score of the overall management effectiveness of the MPA in

terms of the literature review and community survey is calculated as a percentage following the same equation used in previous chapters and indicated below:

Final Score = (Total scores obtained/ Maximum scores of indicators) x 100.

The above equation was also applied for measuring the effectiveness of the management elements, which had different maximum scores based on the number of indicators. For example, 12 indicators were used to assess the effectiveness of '*Context*' via the literature review and community survey in this thesis, so the maximum score of this element was 36 (12 x 3). The Final Score was either categorised as Low (0%–25%), Moderate (>25%–50%), High (> 50%–75%), or Very High (>75%). Ranks of Low and Moderate were assessed as inadequate while High and Very High were adequate for managing the MPA.

7. 5 Results

7.5.1 Overall effectiveness

The Final Score for the overall management effectiveness of the MPA was 31% (ranked Moderate) for all seven elements tested using the literature review and community questionnaire. This suggests that the overall management of the MPA is inadequate.

The scores for the seven management elements assessed for the overall management effectiveness (via the literature and community questionnaire) varied and no element was assessed as adequate (Figure 7.1). The scores ranged from 43% (ranked Moderate) to 24% (ranked Low), which were recorded for '*Planning*' and '*Outputs*' respectively. Given the ranking categories used in this chapter, each overall management element was assessed as inadequate for the MPA.

7.5.2 Effectiveness using the literature review and community survey

The Final Score for the management effectiveness of the MPA via literature review (38%) was higher than that via the community survey (27%). However, given the ranks of the Final Score scales, both of these two scores were similarly ranked as Moderate, meaning that the management of the MPA was assessed as inadequate either via the literature review or

community survey/questionnaire results. Therefore, the overall assessment results via these two broad approaches were the same.

However, the final scores for the elements assessed for the MPA management either via the literature review or community survey varied (Figure 7.1). The highest final score recorded was for '*Context*' (62%) via the literature review, which was ranked as High. In contrast, the final score for this element via the community survey was 17% (ranked Low). The final scores for the other six management elements ranged from 45% to 22% via the review, and 50% to 22% via the survey. Each of these six elements was ranked either Low or Moderate. The elements were assessed, either via the literature review or community survey, as inadequate except for '*Context*', which was adequate via the literature review.

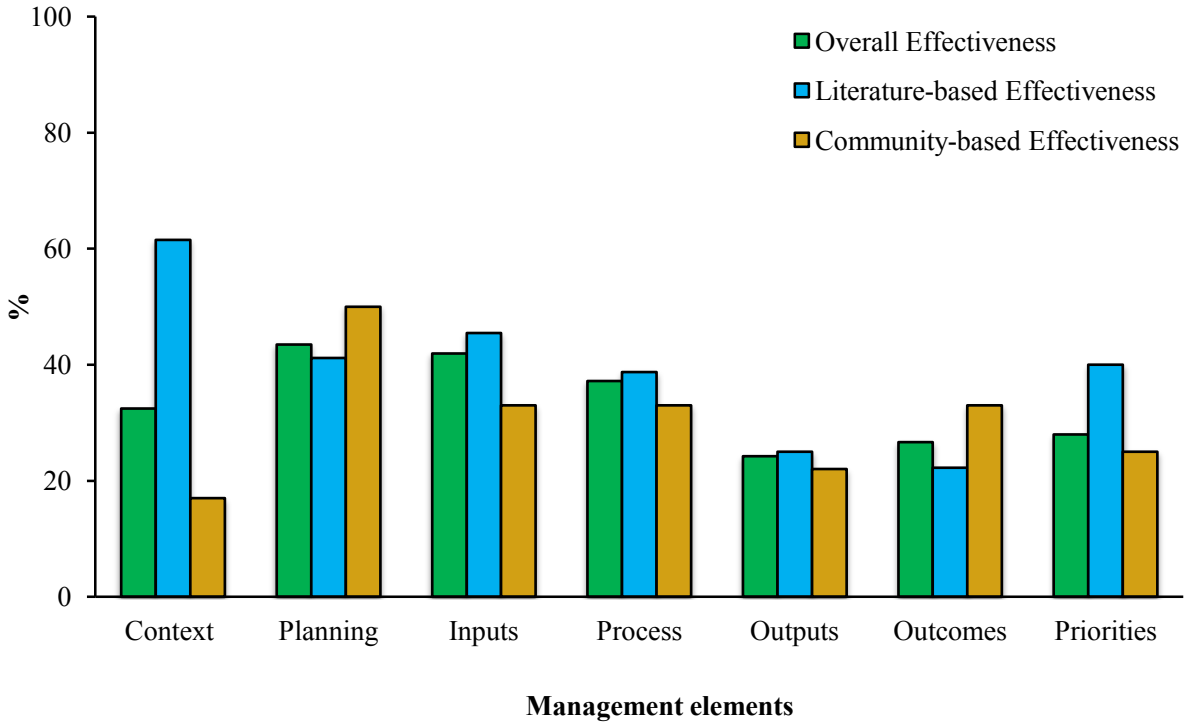


Figure 7.1 The overall effectiveness scores (percentages) for each of the seven management elements assessed for the Socotra Island MPA management. Scores: Low = 0%–25%; Moderate = >25%–50%; High= >50%–75%; Very High = >75%.

7. 6 Discussion

7.6.1 Overall discussion

Results from this chapter, combining all results from the previous chapters (3, 4, 5 and 6), showed that the overall effectiveness of the Socotra Island MPA management was ranked Moderate, meaning that management of this area was inadequate. This could indicate that managers face some constraints to achieve the management objectives of the MPA effectively. These constrains may include insufficient and insecure financial resources, and a weak institutional framework for the MA, as discussed in Section 3.4, Chapter 3. As discussed in Chapter 3, these are common constraints for management of MPAs worldwide, particularly in developing countries (e.g. Bennett and Dearden, 2014b; Van Lavieren and Klaus, 2013; Muthiga, 2009; Perera and de Vos, 2007).

Inadequacy in management of an MPA is not uncommon, with many MPAs worldwide thought to be inadequately managed (e.g. Pajaro *et al.,* 2010; Christie and White, 2007; Mora *et al.,* 2006). For example, only 10–35% of existing MPAs worldwide achieve their management objectives (Pajaro *et al.*, 2010). Many coral reef MPAs worldwide have poor management (Christie and White, 2007).

7.6.2 Management elements

A noteworthy finding from this chapter is that each element was rated as 'inadequate' using either the literature review (Chapter 3) or community survey approach (Chapters 4, 5 and 6) for the assessment except for the element '*Context*'. This element was adequate for the MPA when it was assessed via the literature review, but inadequate via the community survey. The different criteria (represented by indicators) used for each approach explain such a difference. Based on the literature review, the rank for this '*Context'* (High) was influenced primarily by a very high rank for legal status and a high rank for the community's participation (Section 3.5.2, Chapter 3). Scoring the indicator in relation to this participation was based on whether there is a wide range of community groups (Appendix C), but not on whether the participating stakeholders were from different locations. In contrast, based on the

community survey, the indicators relating to the community's awareness (Chapter 4) and participation (Chapters 4 and 5) within '*Context'* were scored low. Scoring these indicators was based on proportions of many respondents from different locations, including remote areas (Chapter 2). The results suggest that the assessment in relation to community's participation or awareness in relation to an MPA should be related to different stakeholders from a wide range of local locations via a literature review and a community survey. This should be applied when there are awareness-raising programs and participatory approaches for an MPA management.

7.6.3 Implications of the approaches

7.6.3.1 Strengths and challenges

Combining several comprehensive approaches, based on the literature review and community survey, applied in this chapter allowed the effectiveness of the MPA management to be more thoroughly assessed compared with just using one of the existing approaches on its own. This mixed-approach method was a valuable evaluation strategy to provide a thorough understanding on how the MPA is managed based on detailed information in relation to activities of the MA (Chapter 3) and a comprehensive community survey (Chapters 4, 5 and 6) with different approaches. These approaches included the community's awareness of several management criteria (Chapter 4); participation in management-related activities (Chapter 4); satisfaction with many management criteria (Chapter 5) and preferences for improving the MPA management (Chapter 6) of diverse community groups from different locations. The method also added new understanding regarding the similarities and differences in effectiveness of each management element based on such different approaches (this Chapter).

The new management element '*Priorities*' created in this PhD study was useful in indicating whether the Yemeni government set different priorities for improving the MPA management and considered inputs from the local community in selecting priority alternatives during implementation of the management as discussed in Chapters 3 and 6 . This was assessed using the literature review (Chapter 3). The element '*Priorities*' was also useful in

investigating whether the future priorities set by the Yemeni government aligned with the community's preferences for improving management of the MPA, which was assessed using the community survey (Chapter 6).

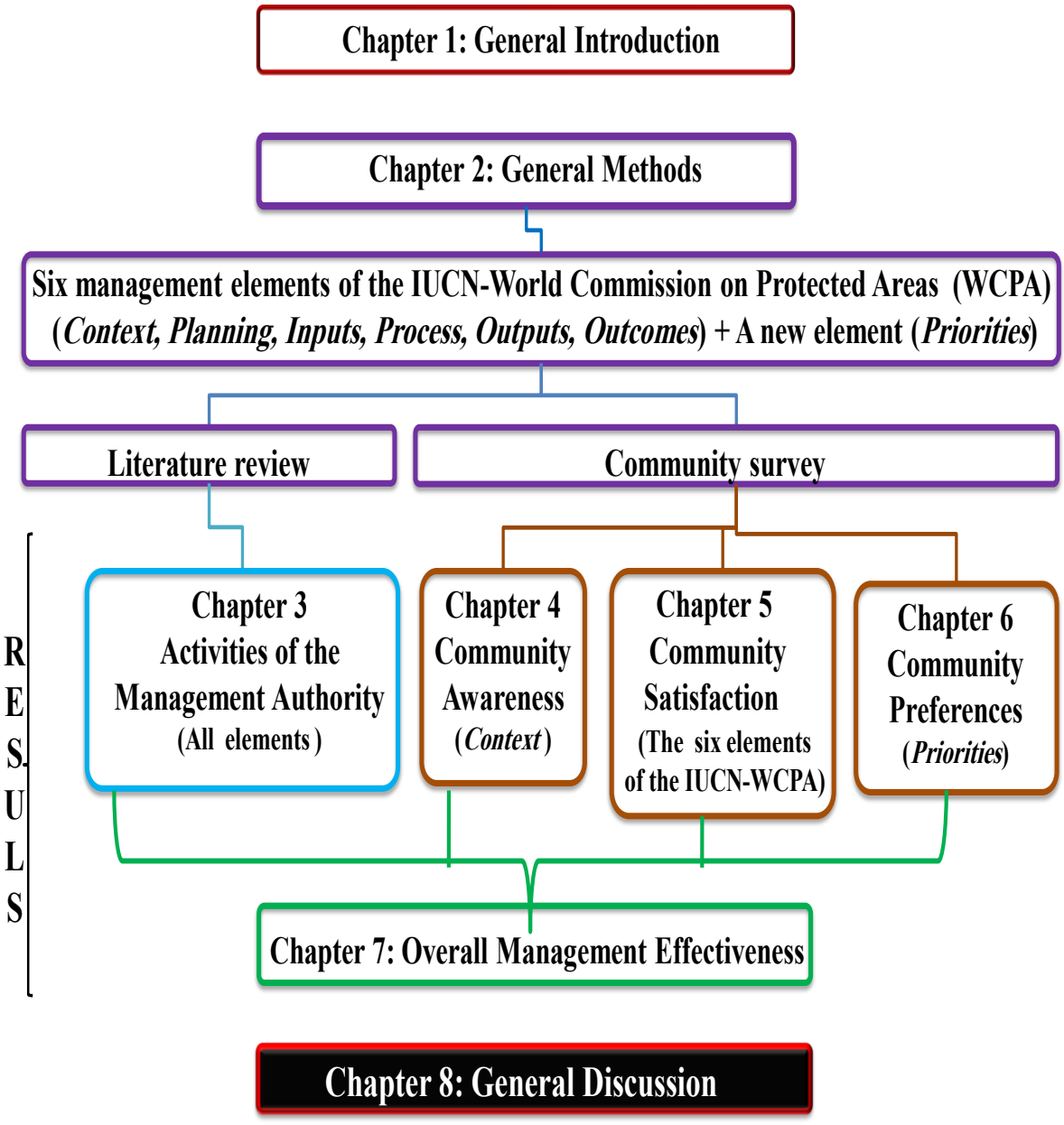
7.6.3.2 Further studies

An important direction of future research would be to use the same indicators via the literature and a community questionnaire within the seven management elements for assessing overall management effectiveness of an MPA. These indicators could relate to the element '*Context'* such as "*Do stakeholders from different local places participate in MPA management-related activities?"* when there is a participatory approach for an MPA management. This may give deeper insight into the quality of the assessment and its difference when it is conducted via a literature review and a community questionnaire.

7. 7 Concluding remarks

The key finding on the overall management effectiveness of the Socotra Island MPA indicates that a comprehensive community survey (Chapter 4, 5 and 6) is a complementary approach to a literature review (Chapter 3) for the MEE of an MPA. The differences in assessment via the literature review and community survey in relation to management elements suggest that using several approaches in assessing management effectiveness of an MPA worked well. Conducting such an assessment via a comprehensive community survey can indicate how effective the activities conducted by a MA for MPA management.

Chapter 8: General Discussion



8.1 Summary and synthesis of thesis findings

This thesis aimed to design and test a comprehensive method to assess the management effectiveness of MPAs. This method considered the community in a broader way than has typically occurred (Chapter 1), and it was applied to the MPA on Socotra Island, Yemen. Achieving this overarching aim necessitated different approaches, including adopting the *WB Scorecard Tool* (Staub and Hatziolos, 2004) six elements (*Context, Planning, Inputs, Process, Outputs* and *Outcomes*) addressed in the IUCN-WCPA Evaluation Framework (Hockings *et al.*, 2006; 2000) (Figure1.1, Chapter 1) and creating an additional element '*Priorities*'. These were applied within the two broad approaches (literature review and community survey) in my PhD study.

There are two key implications that arise from my PhD study. First, the combination of the different approaches I developed is a valuable evaluation strategy in understanding the effectiveness of MPA management more comprehensively. Second, a comprehensive community survey is a complementary approach to a literature review in assessing management effectiveness of MPAs, and may reveal more detail regarding success or aspects identified in the literature review. Areas for future research that are needed to improve MPA assessments include studying the correlation between the attitude levels across several management fields in relation to an MPA, including education levels; and assessing the same indicators for the two broad approaches (literature review and community survey) used in this PhD study to equally test the effectiveness using each approach. In summary, the findings of this thesis included: i) there are difficulties faced by the MA to manage the Socotra Island MPA effectively; ii) the MPA is failing to meet the ecological and social objectives due to combinations of poor planning, inadequate resources and socioeconomic consequences associated with establishment of the MPA; and iii) insufficient annual budget allocated for the MA and the institutional weakness were all major constraints for achieving MPA objectives.

8.1.1 Overall summary and findings

This thesis addressed five research questions, as outlined in Section 1.6, Chapter 1. To answer these research questions I applied two broad approaches (a literature review and a community survey). The literature review was used for Research Question 1 (*How effective is the Socotra Island MPA in terms of management activities of the MA?*), where I collected detailed information and developed 43 indicators to answer this question (see Chapter 3). The community survey was based on a questionnaire for Research Questions 2 (*To what extent is the local community aware of different management criteria relating to the Socotra Island MPA and to what extent does the community participate in MPA management-related activities?*), 3 (*To what extent is the local community satisfied with the Socotra Island MPA management?)* and 4 (*Are the priorities set by the Yemeni government aligned with the local community's preferences for improving the Socotra Island MPA management?*) (see Chapter 4, 5 and 6, respectively). I developed 29 indicators to answer these research questions based on responses to this questionnaire. In the survey, I interviewed a wide array of local stakeholders and community groups which included Socotrans (n=414) and Non-Yemeni Socotrans (n=66). I adapted the scoring system of the *WB Scorecard Tool* (Staub and Hatziolos, 2004) for scoring the indicators to assess the management effectiveness of the MPA. The Final Score result was ranked Low, Moderate, High, or Very High (see Chapter 2). I found that:

- The overall management effectiveness of the MPA was Moderate using the literature review approach (Chapter 3);
- The local community's awareness of different management criteria relating to the MPA was low and community's participation in MPA management-related activities was limited (Chapter 4);
- The majority of the local community was not satisfied with the MPA management (Chapter 5); and
- The priorities set by the Yemeni government were not aligned with preferences of the local community for improving the MPA management (Chapter 6).

I then combined the score results for the 72 indicators from the two broad approaches (mentioned above) to answer Research Question 5 (*How effective is the overall management of the Socotra Island MPA in terms of management activities of the MA and the community's awareness, participation, satisfaction and preferences?*). I found that the overall management effectiveness of the MPA was Moderate (Chapter 7). This suggested that the MPA management was inadequate. Inadequacy of management may lead to failure in managing the MPA effectively. Such inadequacy is similar to many MPAs worldwide, as indicated in Sections 1.2 and 7.5, for reasons indicated in Section 8.1.2 below.

8.1.2 The MPA management inadequacy

I found that the main reasons for inadequacy of the overall MPA management included insufficient operational budget, lack of marine environmental plan, inadequacies of awareness-raising environmental programs and low participation of communities in management-related activities. These reasons are common for many MPAs worldwide (e.g. Kusumawati and Huang, 2015) as discussed in the Chapters 3, 4, 5 and 6. Ferraro (2009) and Hockings *et al.* (2009) have indicated that insufficient financial resources are the single most significant obstacle to PA management, including MPAs. Lack of an environmental management plan for an MPA can cause conflicts between managing authorities and other related authorities for a MPA in using and managing marine resources of MPAs sustainably. Such conflicts could result in lost opportunities and damage to the resources and values of an MPA (Young and Young, 1993). This happened between the Socotra Island MA with the office of Ministry of Fish Wealth in managing fisheries within the Socotra Island MPA (Chapter 3). Inadequacy of information about MPAs has constrained planning and management of these areas in several tropical nations (Alder, 1996a). Inadequate involvement with community groups could lead to reduced chances of successfully achieving objectives of MPAs, including biodiversity protection and fisheries sustainability (Helvey, 2004; Agardy *et al.*, 2003; Manson and Die, 2001). My assessment from Chapters4, 5 and 6 suggested that the quality of the communication between the local communities of Socotra Island and the MA was inadequate, which in turn could lead to conflicts in managing the MPA. Community involvement, along with information dissemination, communication and

compromise, are the primary strategies for reducing conflicts in MPA planning process (Wolfenden *et al*., 1994), and this strategy is yet to be tested within the Socotran context.

The inadequacy of the MPA management suggested that the Yemeni government did not meet the ecological objectives identified in the MPA's CZP as listed in Section 3.5.1.1, Chapter 3, though the Yemeni government played a dominant role in developing the legal status of the area (Chapters 3 and 7). The decline in coral reefs (Abdulaziz *et al.*, 2005), increase in mangrove cutting, harvesting of sharks for fins and collection of sea cucumbers (Van Damme and Banfield, 2011) and contamination of beaches with litter (personal observation, 2011) in Socotra Island are all indicators of the challenges of meeting ecological objectives, including marine biodiversity conservation, of the MPA. This finding is similar to National Marine Parks (NMPs) in the Andaman coast of Thailand, where overexploitation and destructive fishing, degradation and loss of habitats, and contamination threaten ecological health, and fisheries are in decline (Webb *et al*., 2004).

The inadequacy of the MPA management also suggested that the Yemeni government did not meet the cultural and socioeconomic objectives identified in the CZP. Overfishing in the MPA has increased due to the breakdown of the Socotran fishing practices that were previously regulated by traditional laws based on lower fishing efforts (Van Damme and Banfield, 2011). Tourism livelihood and public services, such as health, electricity and education, have not been improved since declaration of the CZP in 2000 (Chapter 3). Such findings are not similar to Pacific Island MPAs, which improved their traditional management measures, fisheries landings
and health (Cohen, 2008). However, the findings for the Socotra Island MPA are similar to the MPAs in Philippines and Indonesia which do not provide adequate economic benefits to communities (Christie, 2005). Seventeen Thai NMPs also did not improve the tourism livelihood (Bennett and Dearden, 2014b).

8.1.3 Recommendations for improving the MPA management

If the Yemeni government is to improve the MPA management of the Socotra Island MPA, they may consider the following key recommendations:

- Allocating and securing a sufficient operational budget. This could be done through: levying entry fees for non-resident visitors of the Socotra Island MPA, and collecting fines from violations of the Yemeni *Environment Protection Law*. These much needed funds could then be allocated in the national budget as proposed in the Yemeni *Cabinet Decree No. 49 of 2008*. The collection of entry fees were expected to be starting in 2009 according to this decree, but has not happened yet (as indicated in Chapter 3).

- Developing and implementing an action management plan for the MPA. Such a plan is an important tool for managing MPAs (e.g. Alexander, 2008; Thomas and Middleton, 2003).

- Developing awareness and education programs for the local community, which reach across multiple community groups and regions, in order to improve local community awareness of the conservation goals of the MPA. Such programs could establish a sustainable, lasting motivation for the local community to preserve and protect biodiversity (Rodríguez-Martínez, 2008).

- Involving the local community, from different locations, in investigations of stakeholders needs in relation to livelihoods and services. Poverty alleviation and economic development should be included within the overall planning and management framework for an MPA because they are critical to effectiveness of this area for achieving its objectives (Charles and Wilson, 2009; Pomeroy *et al.*, 2007).

- Developing mechanisms for the effective participation of diverse stakeholders and community groups in activities related to MPA management. It is important to have such mechanisms for a more complete understanding and incorporation of the social, economic, cultural, political, and environmental context within which the MPA is going to operate (Bennett and Dearden, 2014b). It is often more important to organise regular public consultations than to have a few selected stakeholders to discuss the process in managing PAs, including MPAs, on behalf of a large community (Geoghegan and Renard, 2002).

The above key recommendations are essential to strengthen the institutional framework and relationships of trust between community groups and the MA. This could promote the

durability of the MPA, thus helping to meet the management objectives of this area, including marine biodiversity conservation.

8.2 Implications of the study

8.2.1 Overall implications

The mixed-approach method I used in this PhD study was a valuable evaluation strategy for assessing management effectiveness of an MPA for at least two reasons. First, this method incorporated detailed information from the MA, and second, it involved extensive interviews with a diverse range of community subgroups, including *Fishers*, *Handymen* and *Housewives*, within the MPA to explore their awareness of the MPA, satisfaction with management of this area and their preferences for improving it. Other reasons included visiting the MA for up-to-date information and involving communities from many locations, including remote areas, along almost the entire coastline of the MPA/Socotra Island. My study revealed information that should be considered in the evaluation process such as information on the alignment of preferences between the government and communities and information gained from the people living in the remote areas. The mixed-approach method allowed the effectiveness of MPA management to be comprehensively evaluated.

Results from this PhD study support Dahl-Tacconi (2007; 2005); Worboys (2007) and Day *et al.* (2003) (see Chapter 1) on the need to combine different evaluation approaches for comprehensive purposes. However, the time and costs involved were challenges in assessing the management effectiveness of the MPA. I agree with Ferraro (2009) and Hockings *et al*. (2009) that researchers should consider such challenges when commencing evaluations.

Some challenges associated with this mixed-approach method include difficulties for researchers obtaining a sufficient budget and having to dedicate a long time to combining different approaches in assessing the management effectiveness, particularly for a large MPA such as Socotra Island. Such approaches include visiting the responsible authority and the actual area to conduct comprehensive community survey-based questionnaires for this assessment in developing countries. In this case, researchers may contact and train local

people or staff from a MA to collect information and do the evaluation, including the survey, for them. However, these approaches could also be time-consuming for local persons to collect detailed information or be experts in such an assessment, and results may be biased. The local communities may give vastly different answers by other local people, particularly staff from a MA. Another alternative approach could be through using the Internet or email-based questionnaires. This approach could work for an MPA in developed nations; however, in developing nations it could be challenging to get a large enough sample size from different community subgroups for different reasons due to issue with education and access to the Internet. Many subgroups, including *Fishers* and *Housewives*, are not well educated and the Internet is not common in these countries compared with developed countries. Therefore, it is important for researchers to allocate sufficient budget and dedicate adequate time to visit an MPA and combine different approaches to allow management effectiveness of an MPA to be comprehensively assessed and obtain good results from their studies.

8.2.2 '*Priorities*' as an additional management element

Creating the seven indicators of management effectiveness in relation to the new additional element '*Priorities*' was useful for showing whether there were appropriate strategies and actions taken by the Yemeni government for improving the MPA management. Three indicators were used to investigate whether the Yemeni government set and implemented priority actions for managing the MPA and considered inputs from the local community in selecting priorities (see Table 3.1, Chapter 3). Four indicators were used to investigate the alignment between the Yemeni government's priorities with the community preferences for improving the MPA management in the future. The approaches used in relation to '*Priorities*' were a valuable indicator in revealing the quality of the communication of a MA with a local community, by showing whether the priority action taken by the MA were aligned with community preferences for improving the MPA management. The Yemeni government and the local community have different preferences for improving MPA management as I found in Section 6.5, Chapter 6.

As indicated in Chapter 1, the approaches I used in relation to '*Priorities*' were not identified in the literature, including the ICUN-WCPA Evaluation Framework (Hockings *et al.*, 2006;

2000) for evaluation of effectiveness of PAs, including MPAs. However, researchers have highlighted the importance of inputs from communities for improving MPA management (e.g. Ruiz-Frau *et al.*, 2015, Wadsworth *et al.*, 2014; Himes, 2007). There is evidence that considering inputs from stakeholders can enhance the quality of environmental decisions (Ruiz-Frau *et al.*, 2015). I agree with these authors that there is a need to consider inputs from stakeholders and communities to enhance the quality of decisions taken by governments in selecting the most appropriate priorities for improving an MPA management. Through using the approaches I created in relation to '*Priorities*', researchers can detect whether governments consider inputs from communities in setting priority strategies for improving the MPA.

8.2.3 Type of data

Findings from my PhD study align with Hockings *et al*. (2009) that collecting detailed information (qualitative and/or quantitative data) is needed to assess management effectiveness of PAs, including MPAs. However, this thesis identified an important gap for assessing management effectiveness of MPAs in general. In Chapter 1, I identified that the types of data collected were critical. Collecting detailed qualitative and quantitative information was helpful to thoroughly understand the status of the MPA.

8.2.4 Community involvement

8.2.4.1 Overall implications

Although there is no systemic comparative study to assess whether community involvement is important in the evaluation process (Taut, 2008; Wallace, 2008) (Chapter 1), my PhD study revealed that involving the community was a useful approach for showing the differences in results when I used the literature review compared to the community survey to assess the management effectiveness of the MPA. My literature-based review suggested that awareness-raising programs relating to management of the MPA were comprehensive and the MA involved a wide range of stakeholders in management-related activities in relation to this area, which were assessed as adequate for managing this area (Chapter 3). However, the results from the community survey indicated that the majority of the local communities were

unaware of different criteria in relation to the MPA, including the geographical scope of the MPA and its zoning categories, which were assessed as inadequate for managing this area (see Section 4.5 in Chapter 4). The results also showed the majority of the local community did not participate in the management-related activities, which was also assessed as inadequate for managing the MPA (Chapter 4). This study indicated that involving communities is important to have evidence of the effectiveness of some activities, such as awareness programs, conducted by a MA for an MPA. This in turn supports Bryson *et al.* (2011); Patton (2008); Hockings *et al.* (2006); Stoll-Kleemann and Welp (2006); Pomeroy *et al.* (2004) and Mathie and Greene (1997) on the importance of involving communities in evaluations for credibility.

However, there were challenges associated with timing and costing for the community survey, including interviews with people (mainly fishers) living in remote areas. The survey was conducted during a public protest in Yemen and some respondents hesitated to be interviewed at the beginning because they thought the questionnaire was related to politics. The questionnaire was time consuming in explaining the purposes of the survey because most of respondents had low levels of education and some were illiterate (see Chapter 2). It was also costly to visit 30 locations (two towns and 28 villages) along nearly all the coast of Socotra Island (3625km²), especially given the difficulties in access and communication to remote areas where Socotran people, mainly fishers, live. However, involving voluntary local assistants, particularly Socotrans, in the survey facilitated its success through building trust with respondents for interviews and reducing the associated time and cost required. In addition, the respondents, particularly Socotrans, were cooperative for interviews when they clearly understood the purpose of the survey.

8.2.4.2 Range of community subgroups

Involving a wide array of community subgroups in the assessment allowed me to thoroughly understand the effectiveness of awareness-raising programs conducted by the MPA (Chapter 4), but their knowledge about the MPA could affect their attitudes (Chapter 5) and preferences for improving its management (Chapter 6). The differences in knowledge within community subgroups about MPAs can affect stakeholder opinions toward MPA management (e.g. Engel *et al.*, 2014; Cinner *et al*., 2010; Ruddle, 2000). The local

community had low awareness about the MPA as indicated in Section 8.1.1. The majority of the local community had insufficient knowledge on the geographical scope and zoning categories of the MPA (see Section 4.5.1.1, Chapter 4), but they were satisfied with its zoning design (see Section 5.5.2, Chapter 5). The likely reason is that the community did not want more restrictions on the marine resources of the MPA as revealed in Chapter 6. The majority of the local community did not prefer amending the MPA's zoning plan or increasing regulations for improving its management, though such aspects were priorities set by the Yemeni government (see Section 6.5.2, Chapter 6).

Accordingly, I agree with Bryson *et al.* (2011) that in some stages in an evaluation process it could be necessary to narrow the list of community subgroups included. I suggest researchers involving a wide range of stakeholders and community subgroups to investigate whether the people are aware of an MPA management, including the design. If the majority of stakeholders were aware of an MPA, researchers could continue involving such diverse groups to explore community satisfaction with management of this area and preferences for improving it. However, in the case where the majority of the community subgroups are unaware of the MPA management I suggest researchers narrow the list of the stakeholders to potential user groups (decision makers and/or primary users) to explore their satisfaction and preferences. These groups could include related governmental and fishery officials as decision makers because they may have access to more information on an MPA than primary and secondary groups do. As I found in Section 4.5, Chapter 4, more respondents from the *Socotran Decision Maker Group* participated in management-related activities than those from the *Socotran Primary User Group*, *Socotran Secondary User Group* and *Yemeni Non-Socotran Secondary User Group*. Narrowing such a list in this case would reduce the time and cost associated for the study.

8.2.4.3 Social scale

While this PhD study supports Hockings *et al*. (2006), who stated that in some circumstances it is difficult to assess management effectiveness of an MPA for similar challenges mentioned above, I agree with Bruyninckx (2009) that the social scale should be considered in evaluations (Chapter 1). Considering the large social scale in this assessment was an indicative approach in revealing the extent to which the communication system of the MPA

reached the local community. As indicated above I completed the survey along almost the entire coastline of the MPA, including very remote areas. The results from Chapter 5 showed fishers living in the very remote area of the Island were very dissatisfied with the management more than other locations within the geographical scope of the MPA. A head of a very remote area (more than two villages) indicated that staff from the MA did not reach this very remote area (see Chapter 5). This suggests that there was serious problematic communication between fishers living in this area with the MA. Therefore, my PhD study emphasises consideration of a wide geographic scale in the community survey to assess the management effectiveness of an MPA more comprehensively.

8.2.4.4 Scoring system

The secondary detailed information and community survey used in my PhD study were useful in developing the scoring system of the *WB Scorecard Tool* (Staub and Hatziolos, 2004) objectively. The detailed information I collected whilst visiting the MA for up-to-date data and clarification allowed the indicators to be thoroughly scored to assess the management effectiveness in terms of activities conducted by the MA (Chapter 1). Involving the large number of community members (480) was also helpful in scoring the indicators associated with the community survey confidently. I agree with Cook *et al.* (2014) and Leverington *et al.* (2008b) that a scoring system can be superficial for the MEE of PAs, including MPAs, because the rating of indicators is subjective, especially when used by managers (Alder, 1996b). However, subjectivity could be significantly reduced when researchers make considerable efforts to collect robust standardised data, have transparent analysis techniques and conduct a comprehensive community survey, as has been done in my PhD study.

8.3 Contributions to the literature

My PhD study contributes to improving the MEE of an MPA in several key ways, which are summarised in Table 8.1. Developing approaches for such assessment is still in its early stages (Addison *et al.*, 2015). My major contribution to the literature was the inclusion of a mixed-approach method to assess management effectiveness of an MPA comprehensively

and finding this assessment useful to provide a thorough understanding on how an MPA is managed. Such contribution included improving the accuracy of the version of the assessment sheet (indicators and scoring system) of the *WB Scorecard Tool* (Staub and Hatziolos, 2004) by adding specific indicators and weighting scores of all indicators. These authors point out that the accuracy of this tool might be improved by weighting the various scores. My improvement of the *WB Scorecard Tool* (Staub and Hatziolos, 2004) leads to increase the efficiency of this method in assessing management effectiveness of an MPA.

Another major contribution was improvement of the project cycle management established by the IUCN-WCPA Evaluation Framework (Hockings, 2006; 2000), by creating a question 'what will we do' in relation to an additional element (*Priorities*) within a new stage '*Next Steps*'(see Figure 8.1). As indicated in Chapter 1, this cycle has specific questions in relation to the six elements (see Figure 1.1, Chapter 1). The elements are grouped into three stages: *Design/Planning* (*Context and Planning*); *Adequacy/Appropriateness* (*Process and Inputs*) and *Delivery* (*Outputs and Outcomes*), to reflect the three main themes of PA management (Hockings *et al*., 2006).

For a well managed MPA, governments need to address a question such as 'what will we do' to improve their MPA management in terms of setting and implementing priority actions, especially when such an area does not provide effective ecological and social benefits as outcomes for conservation and humans, respectively. Researchers place emphasis on considering inputs from communities to improve an MPA management (e.g. Ruiz-Frau *et al.*, 2015; Wadsworth *et al.,* 2014; Himes, 2007). However, as I indicated in Chapter 1, no known evaluation process considers the appropriateness of priority actions set by a government for managing an MPA and whether these priorities are aligned with community preferences for improving this area. By considering these approaches in assessing management effectiveness of an MPA, researchers would understand whether governments have an effective mechanism for improving it. Researchers can then provide more information and recommendations to governments considering whether government's priorities mismatch community preferences for improving an MPA management. Based on the usefulness of '*Priorities*' found in this thesis, I propose researchers consider the approaches I used in relation to this element as a complementary stage '*Next Steps*' after

'*Delivery*' addressed in the project cycle management (see Figure 8.1) to increase efficiency of the evaluation process.

Other contributions to the literature include understanding of the validity of involving a wide range of stakeholders, which was not yet addressed in MEE of MPAs. No known study has considered a wide range of community subgroups in such an assessment as I have for this PhD study. Although Dahl-Tacconi (2007; 2005) involved such a variety, her study aimed to investigate the information needed to evaluate management effectiveness of an MPA.

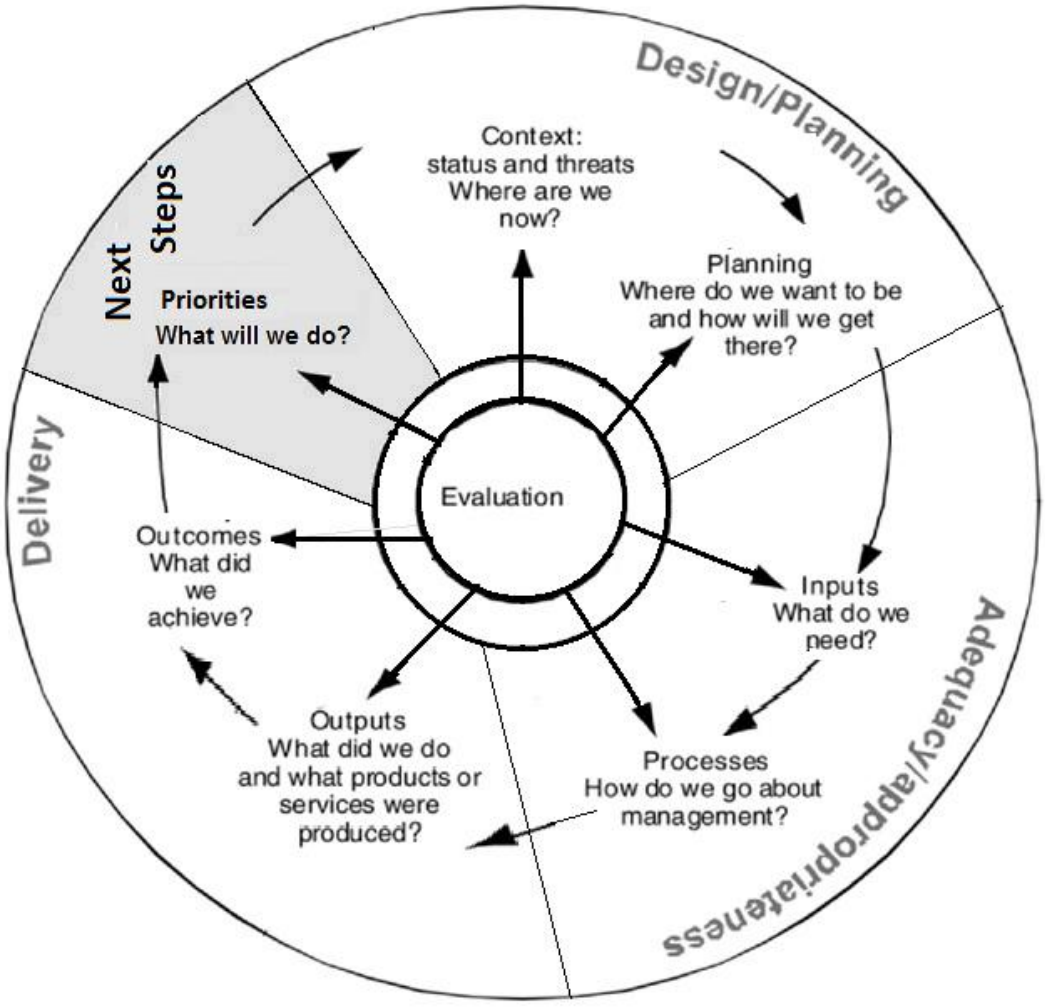


Figure 8.1 A proposed additional stage (*Next Steps*) to the management-project cycle for assessment of protected areas established by the IUCN-WCPA (after Hockings *et al.,* 2006; 2000).

8.4 Areas for future research

I identify specific areas where future research efforts would be valuable in relation to approaches used in this thesis, which are summarised in Table 8.1. Given the value of the approaches I used in my PhD, the important direction of future research would be to consider these areas for the MEE of an MPA. This could give an even clearer picture on evaluation of MPA effectiveness from perspectives that are more diverse. The areas of future research are mainly related to the indicators, scoring system and the community survey as indicated below.

8.4.1 Overall areas for future research

In my PhD study, the number of indicators used in the literature review was different to the number used in the community survey as indicated in Section 8.1. It could be worth assessing the same indicators for the literature and community survey to equally test the effectiveness via each approach in relation to all management elements used in this thesis. This could increase the efficiency of this mixed- approach method.

8.4.2 Scoring system

I suggest revising the few double-barreled questions used as indicators in the assessment sheet of the *WB Scorecard Tool* (Staub and Hatziolos, 2004) to overcome the challenges in scoring these indicators as discussed in Section 3.6.4, Chapter 3. To overcome this issue in my study, I increased accuracy of the scoring system for indicators used in this *WB Scorecard Tool* through using detailed information as discussed in Section 8.2.2.4. However, future surveys should divide double-barreled questions into two questions for clarity and consistency (e.g. Neuman, 2007).

8.4.3 Community survey

Based on the discussion in Section 8.2.4, I suggest investigating whether there are differences between responses among, and between, a wide array of stakeholders and community groups in assessing the effectiveness of an MPA. This could also contribute to progress in the field

of MEE of PAs, including MPAs, since involving a variety of stakeholders in an evaluation process is still debatable, as highlighted in Chapter 1.

It could be informative to investigate the correlation between the opinions of respondents about several management aspects in relation to an MPA with different factors such as locations, knowledge about the sea, and income of respondents. I found that that *Fishers*' satisfaction with the overall management of the MPA was correlated with the locations where they lived in Socotra Island (Chapter 5). Community subgroups from the *Socotran Primary User Group*, particularly *Fishers*, are likely to have more knowledge about the marine environment of Socotra Island than subgroups from the other key stakeholder groups, especially *Yemeni Non-Socotran Secondary User Group*. Cinner *et al*. (2010) found that fishers' knowledge differed from the general public in that they have more information about living resources of MPAs in Kenya. Differences in socioeconomic factors between community subgroups and the time of residence between the Socotran and Yemeni Non-Socotran respondents are likely to drive divergences in their opinions about the MPA management. Attitudes towards PAs can be influenced by these factors, as well as the length of residence (Strickland-Munro *et al.*, 2010; Deery *et al.,* 2005). Some studies, such as McClanahan *et al.* (2009), found preferences of communities toward MPA management can be correlated with their income and resource dependency. Therefore, I suggest investigating correlation of these factors, locations and the time of residence with community satisfaction and preferences in relation to the several management aspects addressed in this study in future work. There is also a need to conduct more studies to investigate the correlation of demographic factors (e.g. education levels, ages and gender) with opinions of local communities towards MPA management, especially when a variety of stakeholders are involved in an evaluation process.

Table 8.1 The key findings and future research topics in relation to the approaches used in this thesis.

Main approaches used	Major implications	Contributions to literature	Areas of future researches
Collecting detailed information to assess activities of the MA to assess management effectiveness of the Socotra Island MPA using the *WB Scorecard Tool* (Staub and Hatziolos, 2004)(Chapter 3).	• This approach was useful in providing baseline information and understanding about how a MPA is managed and whether the MA follows standard procedures for management. • This approach was then helpful in scoring indicators using the scoring system of the *WB Scorecard Tool*.	• I revised and modified the indicators and the scoring system used by the *WB Scorecard Tool* (Staub and Hatziolos, 2004) leading to improving this method. • I created a new indicator in relation to '*Priorities* 'to investigate whether there were priorities set and implemented during the improvement of the MPA management within the modified version, as a new approach to the literature.	• Further revise the few double-barreled questions as indicators addressed in the *WB Scorecard Tool* (Staub and Hatziolos, 2004) in order to increase confidence for the MEE of an MPA..
Eliciting local community's awareness of several management criteria andparticipation in management-related activities in relation to the MPA (Chapter 4).	• This approach was useful in revealing whether awareness raising programs and community participation were effective rather than relying on literature only.	• I created seven indicators (instead of one indicator used in the *WB Scorecard Tool* (Staub and Hatziolos, 2004)) in relation to community's awareness of an MPA for the management effectiveness assessment to increase efficiency of such an approach addressed in this method.	• Test the correlation between the knowledge of community subgroups about management of an MPA with the locations where they live.
Exploring local community's satisfaction with 19 different criteria in relation to the MPA management (Chapter 5).	• I found this approach comprehensive in exploring the satisfaction of the community with different criteria in relation to the MPA management.	• I created 18 specific indicators (instead of one indicator used in the *WB Scorecard Tool* (Staub and Hatziolos, 2004)) in relation to community satisfaction with an MPA management.	• Assess the correlation between satisfaction with several management criteria in relation to an MPA and their relevance and dependency factors.
Investigating local community preferences for improving the Socotra Island MPA management and aligning them with priorities set by the Yemeni government (Chapter 6).	• This approach was a valuable indicator in revealing whether a government considered inputs from the local community for improving the future MPA management.	• I created four indicators to assess the management effectiveness of an MPA through aligning community's preferences for improving it with priorities set by a government, which was not identified in the literature.	• Further investigate the effectiveness of an MPA through alignment of the priorities set by a government with each stakeholder group/community subgroup.

Continued Table 8.1

Main approaches used	Major implications	Contributions to literature	Areas of future researches
Creating '*Priorities*' as a new management element with seven criteria (Chapters 3 and 6).	• This approach was useful and indicative in exploring the management sustainability status of an MPA.	• I created new criteria and indicators in relation to '*Priorities'* for assessing management effectiveness of MPAs using literature and community surveys.	• Develop more indicators to be assessed based on a literature and a community survey in relation to the element of '*Priorities*'.
Involving diverse stakeholders and communities in the assessment process (Chapters 4, 5 and 6).	• I found this approach indicative in measuring the effectiveness of some activities conducted by the MA and the quality of their communication with the local community in managing the MPA. • I found this approach very useful to indicate different opinions, which reveal the quality of the communication of the responsible authority with each community group and stakeholders.	• My PhD study supported the necessity of involving communities and stakeholders in the assessment of the management effectiveness of an MPA. • I demonstrated the validity of involving diverse community groups in assessing the management effectiveness of an MPA, which was a controversial issue identified in the literature.	• Test the differences in the assessment when involving diverse community groups and stakeholders in the evaluation process, especially when the majority are not aware of the MPA management. • Conduct stakeholder analysis to identify potential community subgroups to be involved in the evaluation process.
Combining data from the literature (Chapter 3) and community survey (Chapters 4,5 and 6) (Chapter 7).	• I found that these different approaches developed a valuable evaluation strategy in understanding how effective the MPA was from different perspectives, but it was costly and time consuming.	• I designed a new mixed-approach method for the MEE of an MPA comprehensively. • I improved the project cycle established by the IUCN-WCPA for the evaluation of PAs by creating an additional management element and stage (see Figure 8.1), to increase assessment efficiency.	• Use and assess the same indicators using the literature and a community survey in relation to the seven elements used in this thesis to assess overall management effectiveness of an MPA to test whether there are differences.

8.5 Final concluding remarks

This PhD thesis provides valuable results on the effectiveness of the Socotra Island MPA in terms of the activities conducted by the MA and opinions of the local community about management of this area. These results suggest that the ability of the MPA to bring ecological benefits is weak due to poor planning and the socioeconomic consequences associated with establishment of the MPA. As indicated in Section 1.1, Chapter 1, establishing MPAs can have consequences. Considering the results and recommendations in this thesis could be useful for building momentum for improving future management programs for the MPA by the Yemeni government. This could lead to conserving the marine biodiversity of the MPA as a main outcome for this area and overcome the social consequences. This in turn could increase the management effectiveness of the MPA.

To create a method that assesses management effectiveness of an MPA comprehensively, a combination of detailed information on management-related activities conducted by a MA and community survey involving diverse community groups is needed. Such information should give a clear picture on the extent to which this authority follows standard measures and procedures to manage an MPA and how it deals with the problems affecting this area. Involving community subgroups and stakeholders on a large scale within the geographical scope of an MPA in assessing management effectiveness of this area would enhance the effectiveness of this assessment, by detecting the impact of the management-related activities.

This thesis is a step towards understanding how a comprehensive community survey can be complementary to the activities of a MA for the MEE of an MPA, by providing approaches that are recommended to be adopted for future assessments. Improving the future quality of such approaches will require considering the areas of research addressed in this thesis, given that some key factors (e.g. time, costs) could be challenges for researchers.

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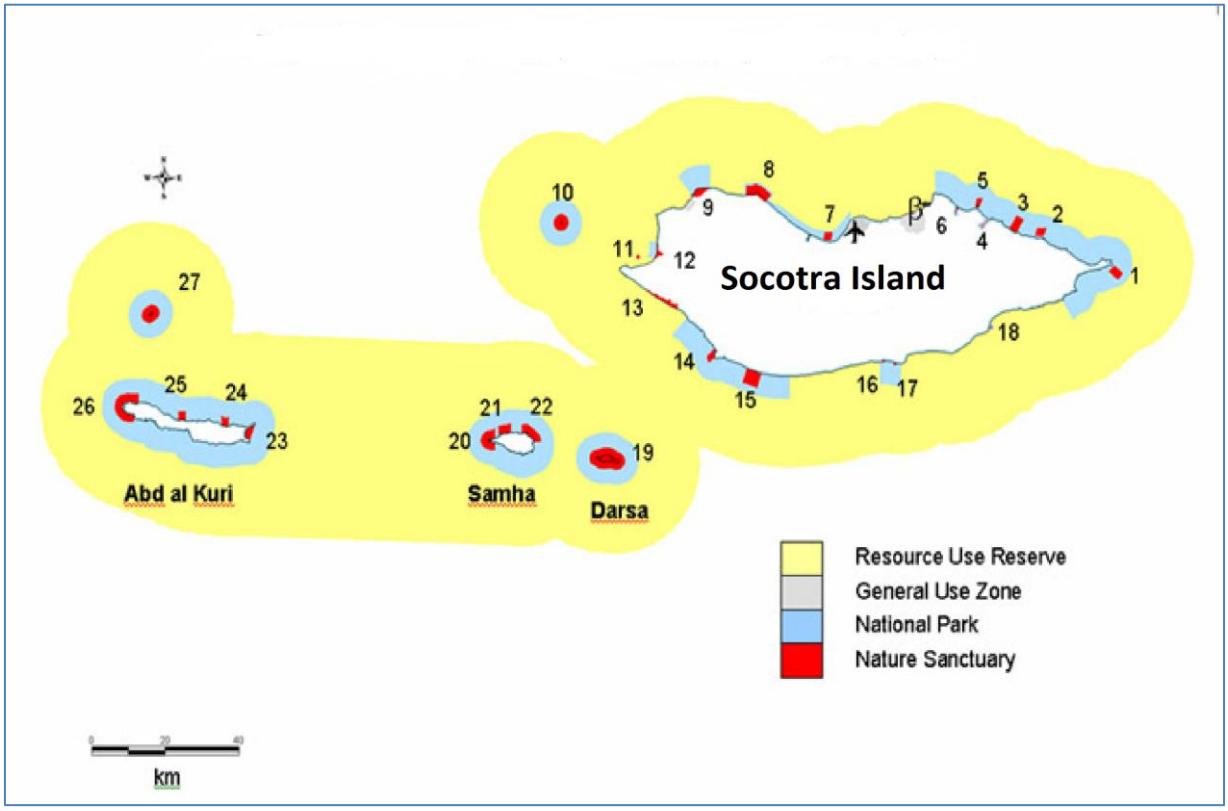
Appendices

Appendix A. The zoning categories of Socotra Island Marine Protected Area, Yemen.



Appendix B. The English version of the questionnaire used for a community survey.

Questionnaire No:

Community subgroup: **Start Time:**

Venue/Location: **Researcher: Zaher Al-Agwan**

Hello, my name is Zaher Al-Agwan. I am a PhD student with James Cook University in Australia and I am studying evaluation of management of the Socotra marine protected area system. I would like to explore opinions of local people on Socotra Island, because the opinions of those closest to the marine protected area system are very important. Would you be able to spare around 30 minutes to answer some questions? The results of my study will be available to local people and at the office of the Environment Protection Authority. The survey is anonymous – I will not write your name on your survey, or mention it in the study.

It is important that you understand each question before answering, so please ask me to repeat or explain anything if needed.

1. **To what extend do you know that the waters surrounding Socotra Island is a marine protected area?**

☐ Little waters (1%-25%) ☐ Some waters (26%-50%)

☐ Many wasters (51%-75%) ☐ Most waters (76%- 99%)

☐ All waters (100%) ☐ Don't Know

2. **What do you think are the primary objective(s) for establishment of the marine protected zones of Socotra Island?**

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3. **In general, in your opinion, what is the main rational behind establishment of the marine protected zones of Socotra Island?**

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4. **The marine environment of Socotra Island has important values. What are these values in your opinion?**(Values are things that make the Socotra MPA a special place)

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5. **In thinking about the issues affecting the marine environment of Socotra Island, in your opinion, what is the effect extent of the following threats on this marine environment? (Dangers/Threats are anything that can damage values of the marine environment- including natural processes, environmental changes or people's behaviors) ?**
(**1**= High Threat; **2**= Medium Threat; **3**= Low Threat; **4** = Not Threat; **D.K.**: Don't know)
(*Please tick one option*)

		1	**2**	**3**	**4**	**D.K.**
A	Invasive Species/Organisms(through boats or foreign ships).					
B	Overexploitation of marine organisms including fish.					
C	Poor coastal planning.					
D	Tourism Activities.					
E	Corals collection.					
F	Litter/Garbage on beaches.					
G	Trawling (by big foreign boat boasts).					
H	Outside Non-Socotran fishers.					
Others: A						

6. **In general, how are you satisfied with the management of the marine environment of Socotra Island?**

Very Satisfied	Somewhat Satisfied	Neutral	Somewhat Dissatisfied	Very Dissatisfied	Don't know/no opinion

Why? *(Please mention the reasons)*

---

7. In relation to to management of the marine environment of Socotra Island, how satisfied are you with the following aspects ?(*Please tick one option***)**
(1 = Very satisfied; **2** = Somewhat satisfied; **3** = Neutral; **4** = Somewhat dissatisfied; **5** = Very dissatisfied –D.K.: Don't know)

		1	2	3	4	5	D.K.
A	Opportunity of your participation in activities in relation to management of the marine environment.						
B	Adequacy of regulations.						
C	Enforcement of the existing legislation.						
D	Current zoning plan.						
E	Skills of the staff members for the MPA management						
F	Facilities/Potentials of the Management Authority.						
G	Awareness/Education programs.						
H	The role given to Socotrans for making decisions in relation to management.						
I	Availability of information.						
J	Researches and studies						
K	Public services presented to Socotra Island						
L	Services delivered to fishers.						
M	Services presented to women in coastal areas						
N	Current status of the coastal and marine environment compared with it before declaring the protected zones.						
O	Current status of living compared with it before declaring the protected zones.						
p	Activities of tourism.						
	Your benefit gained since declaration of the marine protected zones.						

8. Have you participated in any of the following activities in relation to management of the marine environment of Socotra Island? *(You can tick more than one)*

☐ Training workshops/courses

☐ Workshops/Meetings

☐ Awareness/Education program/School Activities

☐ Studies/Researches/Field works

☐ None

☐ Others (Please Specify)……..……..

9. In your opinion, what is the most important aspect or subject matter do you consider that should be taken into account for improvement of the management of the marine environment of Socotra Island in the future?

---

10. In relation to thefuture management of the marine environment of Socotra Island how important are each of the following aspects to you?

(1= Extremely Important; **2**= Very Important, **3**= Important, **4**= Somewhat Important; **5**= Not Important)

		1	**2**	**3**	**4**	**5**
A	Your opportunity of attendance /participation in any activity in relation to the management.					
B	Strengthening participation of other governmental bodies.					
C	Establishing an independent governmental authority replacing the current one.					
D	More restrictive legal measures.					
E	Less restrictive legal measures.					
F	Amending zoning (locations, areas, categories) of the marine protected sites.					
G	Strengthening ability of staff members of the responsible authority.					
H	Increase in facilities/potentials of the responsible authority.					
I	Strengthening the role of Socotrans in the management.					
J	More awareness/education materials.					
K	Improving public services to local community in relation to the MPAs.					
L	Availability of research and monitoring results to local people.					
M	Enforcement of existing legal measures.					
N	More services for fishers/locals.					
O	Development of tourism.					
P	Foreign investment in fisheries.					
Q	Increase in fish catches.					
R	Mitigating or eliminating threats affecting the coastal and marine environment.					
S	Strengthening women empowerment in the management.					
Others (Please specify): …….....						

11. Which of the following sources do you get information on the Socotra marine protected area? *(You can tick more than one)*

☐ Media (Newspapers, TV, Radio) ☐ Newsletters/Magazines ☐ School activities

☐ Non-governmental societies ☐ Family/Neighbours/Friends ☐ EPA staff

☐ Visitors centre (on the island) ☐ Public library (on the Island ☐ Internet

☐ Participation in relevant activities ☐ I do not usually get any news

☐ Other (Please specify).....

12. What are the categories of the marine protected zones of Socotra Island?

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13. Which of the following governmental body is responsible for management of the marine protected zones of Socotra Island?

☐ Office of Ministry of Fish Wealth Authority ☐ Office of Environmental Protection

☐ Tourism Office ☐ Don't know

☐ Other (Please specify):.....

14. What is your highest education level? (*Please tick one)*

☐ Adult study ☐ Primary (1-9 levels) ☐ High School

☐ Graduation ☐ Post graduation ☐ Non-educated

☐ Other (specify):…… ….....

15. How long have you been on Socotra Island? *(Please tick one)*

☐ Since I was born ☐ > 10 years ☐ 5-10 years ☐ 1-5 years ☐ < 1 year

Note:…….....…….....

16. **Are you**: ☐ Socotran ☐ Non-Socotran

17. Sex: ☐ Male ☐ Female

18. Your age: ☐ 15-20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ >50

Finish Time:

THANK YOU VERY MUCH FOR YOUR ASSSISTANCE

Appendix C. Indicators used to assess the management effectiveness of Socotra Island Marine Protected Area in terms of the activities of the Management Authority.

Indicators	**Scores**	**Results**
Management element: '*Context*'		
Criteria: Identification of management objectives Indicator 1: Are management objectives of the MPA are specific and measurable.		
No management objectives are identified for the MPA.	0	
The management objectives of the MPA are identified in general.	1	
The management objectives of the MPA are specifically identified and relate to some biological and socioeconomic aspects.	2	
Management objectives are specifically identified and relate to many different aspects, including biological and socio- cultural economic values.	3	
Criteria: Stakeholder participation Indicator 2: Do diverse stakeholder participate in MPA management-related activities?		
No stakeholders participate or attend in MPA management-related activities.	0	
Limited stakeholders participate and/or attend MPA management-related activities.	1	
Some different stakeholders participate and/or attend MPA management-related activities.	2	
Many relevant stakeholders participate and/or attend in activities of MPA management.	3	
Criteria: Integration of the MPA in a larger Coastal Zone Management Plan (CZMP). Indicator 3: Is the MPA integrated into a larger CZMP?		
There is no discussion about the integration of the MPA into a larger CZMP.	0	
There is some discussion about the integration of the MPA into CZMP but the process has not yet begun.	1	
The MPA is in the process of being integrated into a larger CZMP but the process is still incomplete.	2	
The MPA is part of a larger CZMP.	3	
Criteria: Legal status Indicator 4: Does the MPA have legal status?		
The MPA is not gazetted.	0	
The government has agreed that the MPA should be gazetted but the process has not yet begun.	1	
The MPA is in the process of being gazetted but the process is still incomplete.	2	
The MPA has been legally gazetted (or in the case of private reserves is owned by a trust or similar).	3	
Additional Points for '*Context*'		
Priority threats affecting the MPA are identified with different aspects, including human activities.	+1	

The MPA has received national and/or international recognition for its importance.	+1	
Stakeholder involvement also includes representation from various communities, including religious leaders, and both genders.	+1	
Management element: '*Planning'*		
Criteria: Agreement on management objectives Indicator 5: Have objectives of the MPA been agreed and managed?		
No firm objectives have been agreed for the MPA.	0	
The MPA has agreed objectives, but is not managed according to these objectives.	1	
The MPA has agreed objectives, but is only partially managed according to these objectives.	2	
The MPA has agreed objectives and is managed to meet these objectives.	3	
Criteria: Availability and implementation of a Management Plan (MP) Indicator 6: Does the MPA have MP and is it being implemented?		
There is no MP for the MPA.	0	
A MP is being prepared or has been prepared but is not being implemented.	1	
A MP exists but it is only being partially implemented because of funding constraints or other problem.	2	
A MP exists and is being implemented.	3	
Criteria: Availability of legislations Indicator 7: Are there regulations/policies for the MPA management and are they implemented?		
There is no legislation or policy for controlling fisheries and activities in the MPA.	0	
Legislations for controlling fisheries and activities in the MPA exist but there are major weaknesses.	1	
Legislations for controlling fisheries and activities in the MPA exist but there are some weaknesses or gaps.	2	
Legislations for controlling fisheries and activities in the MPA exist and provide an excellent basis for management.	3	
Criteria: Availability and implementation of a work plan Indicator 8: Is there a regular work plan for the MPA management and are planned activities being implemented?		
A regular work plan does not exist for the MPA management.	0	
A regular work plan exists for the MPA management but a few planned management activities are implemented.	1	
A regular work plan exists for the MPA management and many planned management activities are implemented.	2	
A regular works plan exists for the MPA management and all or most planned management activities are implemented.	3	
Criteria: Function of the MPA design Indicator 9: Does the design of the MPA system allow it to function effectively?		
Inadequacies in MPA design mean achieving the major objectives of the MPA is very difficult.	0	
Inadequacies in MPA design mean that achievement of major objectives is difficult but some mitigating actions are being taken (e.g. introduction of appropriate catchment management).	1	

MPA design is not significantly constraining achievement of objectives, but could be improved (e.g. with respect to larger scale ecological processes).	2	
MPA design helps achievement of objectives; it is appropriate for species and habitat conservation; and maintains ecological processes.	3	
Additional points for '*Planning*'		
There is also a long term master plan (at least 5 years).	+1	
The planning process allows adequate opportunity for key stakeholders to influence the management plan.	+1	
The management plan is a part of a national integrated CZMP management plan.	+1	
The socioeconomic impacts of decisions are considered in the planning process.	+1	
The local culture, including traditional practices, social systems, cultural features, historic sites and monuments, is considered in the planning process.	+1	
There is an established schedule and process for periodic review and updating of the management plan.	+1	
The results of monitoring, research and evaluation are routinely incorporated into planning.	+1	
The MP is tied to the development and enforcement of regulations.	+1	
Management element: '*Inputs'*		
Criteria: Facilities and equipment Indicator 10: Are facilities and equipment sufficient for management needs?		
There are little or no equipment and facilities for management needs.	0	
There are some equipment and facilities but these are inadequate for most management needs.	1	
There are facilities and equipment, but still some gaps that constrain management.	2	
There are sufficient facilities and equipment for management needs.	3	
Criteria: Resource inventory Indicator 11: Is there enough information for the MPA management.	0	
There is little or no information available on the critical habitats, species and cultural values of the MPA.	0	
Information on the critical habitats, species, ecological processes and cultural values of the MPA is not sufficient to support planning and decision making.	1	
Information on the critical habitats, species, ecological processes and cultural values of the MPA is sufficient for most key areas of planning and decision making.	2	
Information on the critical habitats, species, ecological processes and cultural values of the MPA is sufficient to support all areas of planning and decision making.	3	
Criteria: Staff number Indicator 12: Are there enough people employed to manage the MPA?		
There is no staff for the MPA management.	0	
The staff number is inadequate for critical management activities.	1	
The staff number is below optimum level for critical management activities.	2	
The staff number is sufficient for critical management activities.	3	

Criteria: Local staff Indicator 13: Are there local/native people employed for the MPA management.		
There is no local/native staff for the MPA management.	0	
There are some local/native staff members, but not in positions for critical management activities.	1	
Some staff members are locals/native people and in position for critical management activities.	2	
All or most staff members are local/indigenous people and have adequate position for critical management activities.	3	
Criteria: Training for staff Indicator 14: Is there a training program for staff and is it adequate for the MPA management?		
There is no training program for staff.	0	
There is a training program for staff but is partially implemented.	1	
An adequate training program is implemented for staff, but could be further improved to fully achieve management objectives.	2	
There is a sufficient training program for staff.	3	
Criteria: Sufficiency of budget Indicator 15: Is the current budget sufficient?		
There is no budget for the MPA.	0	
The available budget is inadequate for basic management needs and presents a serious constraint to the capacity to manage.	1	
The available budget is acceptable, but could be further improved to fully achieve effective management.	2	
The available budget is sufficient and meets the full management needs of the MPA.	3	
Criteria: Security of budget. Indicator 16: Is the budget secure?		
There is no secure budget for the MPA and management is wholly reliant on outside or highly variable funding.	0	
There is very little secure budget and the MPA could not function adequately without outside funding.	1	
There is a reasonably secure core budget for regular operation of the MPA but many innovations and initiatives are reliant on outside funding.	2	
There is a secure budget for the MPA and its management needs.	3	
Additional points for '*Inputs*'		
There are studies on sustainable use levels of marine resources of the MPA.	+1	
There are additional sources of support (e.g., volunteers, national services, local communities) to control illegal activities in the MPA.	+1	
Management element: '*Process'*		
Criteria: Education and awareness Indicator 17: Is there an education and awareness program?		
There is no education and awareness program.	0	
There is a limited and *ad hoc* education and awareness program.	1	
There is an education and awareness program but it only partly meets needs and could be improved.	2	
There is an appropriate and fully implemented education and awareness program.	3	

Criteria: Communication Indicator 18: Is there communication between stakeholders and managers in relation to the MPA management?		
There is little or no communication between managers and stakeholders in relation to the MPA management.	0	
There is communication between stakeholders and managers in relation to the MPA management but this is not a planned or scheduled program.	1	
There is a planned communication program that is being used to build support for the MPA management amongst relevant stakeholders but implementation is limited yet.	2	
There is a planned communication program that is being implemented to build support for the MPA within relevant stakeholders.	3	
Criteria: Stakeholder involvement Indicator 19: Do stakeholders have meaningful input to management decisions?		
Relevant stakeholders have no input into decisions relating to MPA management.	0	
Relevant stakeholders have some input into discussions relating to MPA management but no direct involvement in the resulting decisions.	1	
Relevant stakeholders directly contribute to some decisions management.	2	
Relevant stakeholders directly participate in making decisions relating to MPA management.	3	
Criteria: Inputs from local communities/native people Indicator 20: Do local/native/traditional people using the MPA have input into MPA management?		
Local / Native/Traditional communities have no input into discussions relating to MPA management-related decisions.	0	
Local / Native/Traditional communities have some input into discussions relating to management but no direct involvement MPA management-related decisions.	1	
Local / Native/Traditional communities directly contribute to some MPA management-related decisions.	2	
Local / Native/Traditional communities directly participate in making MPA management-related decisions.	3	
Criteria: Maintenance of equipment Indicator 21: Is equipment adequately maintained?		
There is little or no maintenance of equipment and facilities.	0	
There is some *ad hoc* maintenance of equipment and facilities.	1	
There is basic maintenance of equipment and facilities.	2	
Equipment and facilities are well maintained.	3	
Criteria: Protection systems Indicator 22: Are systems in place to control access/resource use in the MPA?		
Protection systems (coastal guards, permits etc) do not exist or are not effective in controlling access/resource use.	0	
Protection systems are only partially effective in controlling access/resource use.	1	
Protection systems are moderately effective in controlling access/resource use.	2	

Protection systems are largely or wholly effective in controlling access/resource use.	3	
Criteria: Training for staff Indicator 23: Is there enough training for staff members?		
Staff are untrained.	0	
Staff training and skills are low relative to the needs of the MPA.	1	
Staff training and skills are adequate, but could be further improved to fully achieve the objectives of management.	2	
Staff training and skills are in tune with the management needs of the MPA, and with anticipated future needs.	3	
Criteria: Management of budget Indicator 24: Is the budget managed to meet critical management needs?		
Budget management is very poor and significantly undermines effectiveness (e.g. late release of budget in financial year).	0	
Budget management is poor and constrains effectiveness.	1	
Budget management is adequate but could be improved.	2	
Budget management is excellent and meets management needs.	3	
Criteria: Monitoring and evaluation Indicator 25: Are biophysical, socioeconomic and governance indicators monitored and evaluated?		
There is no monitoring and evaluation on the biophysical, socioeconomic and governance context of the MPA.	0	
There is some ad hoc monitoring and evaluation, but no overall strategy and/or no regular collection of results.	1	
There is an agreed and implemented monitoring and evaluation system but results are not systematically used for management.	2	
A good monitoring and evaluation system exists, is well implemented and used in adaptive management.	3	
Criteria: Legislation enforcement Indicator 26: Can staff sufficiently enforce MPA rules?		
The staff does not have effective capacity/resources to enforce MPA legislation and regulations.	0	
There are major deficiencies in staff capacity/resources to enforce MPA legislation and regulations (e.g. lack of skills no patrol budget).	1	
The staff has acceptable capacity/resources to enforce MPA legislation and regulations but some deficiencies remain.	2	
The staff have excellent capacity/resources to enforce marine protected area legislation and regulations.	3	
Additional points for '*Process*'		
Local and/or native people actively support the MPA.	+1	
There is open communication and trust between local and/or native people, stakeholders and MPA managers.	+1	
There are clear financial contributions/agreements between MPA managers and tourism operators to recover MPA resources for local benefits.	+1	
There is an emergency response capability in place to mitigate impacts from threats.	+1	

Management element: '*Outputs'*		
Criteria: Visitor interpretation signage Indicator 27: Does the MPA have visitor interpretation signage and are they Installed?		
The MPA does not have visitor interpretation signage.	0	
Visitor interpretation signage have been, or being prepared or has been prepared but are not being installed.	1	
Visitor interpretation signage are installed but they are inadequate.	2	
The MPA has adequate installed visitor interpretation signage.	3	
Criteria :Moorings Indicator 28: Does the MPA have moorings and are they installed?		
The MPA does not have moorings.	0	
Moorings have been, or being, prepared but are not being installed.	1	
A few moorings are installed.	2	
The MPA has many installed moorings.	3	
Criteria: Educational and awareness materials Indicator 29: Does the MPA have educational and awareness materials and are they distributed?		
The MPA does not have awareness and educational materials.	0	
The awareness and educational materials have been prepared or produced but are not being distributed.	1	
Some awareness and educational materials for the MPA have been distributed.	2	
Many educational and awareness materials for the MPA have been distributed.	3	
Criteria: Mechanisms for stakeholder participation in decision making management activities (e.g. advisory council) Indicator 30: Are mechanisms available to ensure stakeholder participation?		
There are no mechanisms for stakeholder participation in decision making and/or management activities.	0	
There are mechanisms for stakeholder participation in decision-making but are not being practiced.	1	
A few mechanisms for stakeholder participation in decision-making and/or management activities are practiced.	2	
Many different mechanisms for stakeholder participation in decision making and/or management activities and are practiced.	3	
Criteria: Environmental education activities for stakeholders (e.g. public outings at the MPA). Indicator 31: Are there educational activities for stakeholders?		
There are no environmental education activities for stakeholders.	0	
There are limited environmental education activities for stakeholders.	1	
There are some environmental education activities for stakeholders.	2	
There are sufficient environmental education activities for stakeholders.	3	
Criteria: Management-related activity improvement. Indicator 32: Have MPA management-related activities been improved?		
MPA management-related activities have not been improved.	0	
Limited measures have been taken to improve MPA management-related activities.	1	

Some measures have been taken to improve MPA management-related activities.	2	
MPA management-related activities have been sufficiently improved.	3	
Criteria: Visitor facilities. Indicator 33: Does the MPA have sufficient visitor facilities?		
The MPA does not have visitor facilities and services.	0	
Visitor facilities and services are inappropriate for current levels of visitation or are under construction.	1	
There are some visitor facilities and services, but they could be improved.	2	
Visitor facilities and services are sufficient for current levels of visitation.	3	
Criteria: Staff capacity Indicator 34: Is the staff capacity enough to fulfill MPA management-related needs?		
There is no technical staff.	0	
The technical staff is low relative to MPA management-related needs.	1	
The technical staff is adequate but could be further improved to fulfill MPA management-related needs.	2	
Staff capacity is aligned with the needs of MPA management-related needs and with anticipated future needs.	3	
Additional points for '*Outputs*'		
Multidisciplinary courses have been developed for stakeholders.	+1	
Several materials have been distributed to wide array of local communities in different locations, including remote areas.	+1	
Management element: '*Outcomes*'		
Criteria: Management objectives addressing. Indicator 35: Have MPA objectives been addressed?		
Management objectives have not been addressed.	0	
Management objectives have been addressed somewhat.	1	
Management objectives have been sufficiently addressed.	2	
Management objectives have been significantly addressed.	3	
Criteria: Value status Indicator 36: What is the status of the important values of the MPA as compared to when it was first designated?		
Many important biodiversity, ecological or cultural values are being severely degraded.	0	
Some biodiversity, ecological or cultural values are being severely degraded.	1	
Some biodiversity, ecological and cultural values are being partially degraded but the most important values have not been significantly impacted.	2	
Biodiversity, ecological and cultural values are predominantly intact.	3	
Criteria: Threat status. Indicator 37: Have threats been reduced?		
Threats have increased.	0	
Threats have stayed at approximately the same levels.	1	
Threats have been reduced somewhat.	2	
Threats have been largely reduced.	3	
Criteria: Resource conditions Indicator 38: Have resource conditions improved?		
Resource conditions have declined.	0	

Resource conditions have stayed at approximately the same levels.	1	
Resource conditions have improved somewhat.	2	
Resource conditions have improved significantly.	3	
Criteria: Community welfare. Indicator 39: Has community welfare improved?		
Livelihoods and standards of living in the community have declined.	0	
Livelihoods and standards of living in the community have stayed approximately the same.	1	
Livelihoods and standards of living in the community have improved somewhat.	2	
Livelihoods and standards of living in the community have improved significantly.	3	
Criteria: Economic benefits. Indicator 40: Is the MPA providing economic benefits to local communities, e.g. income, employment, payment for environmental services?		
The MPA does not deliver any economic benefits to local communities.	0	
Potential economic benefits are recognized and plans to release these are being developed.	1	
There is some flow of economic benefits to local communities.	2	
There is a major flow of economic benefits to local communities.	3	
Additional Points for '*Outcomes*'		
MPA management is compatible with the local culture, including traditional practices, relationships, social systems, cultural features, historic sites and monuments linked to marine resources and uses.	+1	
Resource use conflicts have been reduced.	+1	
Benefits from the MPA are equitably distributed.	+1	
The non-monetary benefits of the marine resources to society have been maintained or enhanced.	+1	
Management element: '*Priorities'*		
Criteria: Priority review. Indicator 41: Is there consideration for reviewing and setting strategic priorities needed for improving the MPA management?		
There is no consideration in reviewing and setting strategic priorities needed for improving the MPA management.	0	
There is little consideration in reviewing and setting strategic priorities needed for improving the MPA management.	1	
There is some *ad hoc* consideration reviewing and setting strategic priorities needed for improving the MPA management.	2	
There is potential consideration reviewing and setting strategic priorities needed for improving the MPA management.	3	
Criteria: Stakeholders involvement Indicator 42: Are stakeholders involved in reviewing and setting strategic priorities needed for improving the MPA management?		
Stakeholders are not involved in reviewing and setting strategic priorities needed for improving the MPA management	0	
There is *ad hoc* involvement of stakeholders in reviewing and setting strategic priorities needed for improving the MPA management.	1	
There is usual involvement of stakeholders in reviewing and setting strategic priorities needed for improving the MPA management.	2	

Stakeholders are regularly involved in reviewing and setting strategic priorities needed for improving the MPA management.	3	
Criteria: Implementation of set strategic priorities. Indicator 43: Are set strategic priorities implemented?		
The set strategic priorities are not implemented.	0	
Some set strategic priorities are implemented.	1	
Many strategic priorities are implemented.	2	
All or almost all set strategic priorities are already implemented.	3	
Additional Points for '*Priorities*'		
The implemented priority actions contribute to protection of living marine resources and improvement of community welfare.	+1	
Stakeholder involvement includes representation from the various communities, religious and user groups as well as representation from both genders.	+1	

Appendix D. Indicators used to assess the management effectiveness of the Socotra Island MPA in terms of communities' awareness of this area and their participation in management-related activities.

Criteria: The geographical scope Indicator 1: Is the local community aware of the geographical scope of the MPA?	Scores	Results
Less than 26% of the local community is aware of the correct geographical scope of the MPA.	0	
From 26% to 50% of the local community is aware of the geographical scope of the MPA.	1	
From 51% to 75% of the local community is aware of the correct geographical scope of the MPA.	2	
More than 75% of the local community is aware of the geographical scope of the MPA.	3	
Criteria: MPA management objectives. Indicator 2: Is the local community aware of the MPA management objectives?		
Less than 26% of the local community is aware of a primary objective identified by the government for the MPA management.	0	
From 26% to 50% of the local community is aware of a primary objective identified by the government for the MPA management.	1	
From 51% to 75% of the local community is aware of a primary objective identified by the government for the MPA management.	2	
More than 75% of the local community is aware of a primary objective identified by the government for the MPA management.	3	
Criteria: The most important ecological values. Indicator 3: Are the local community aware of the most important ecological value of the MPA?		
Less than 26% of the local community is aware of the most important ecological value of the MPA.	0	
From 26% to 50% of the local community is aware of the most important ecological value of the MPA.	1	
From 51% to 75% of the local community is aware of the most important ecological value of the MPA.	2	
More than 75% of the local community is aware of the most important ecological value of the MPA.	3	
Criteria: The main rational behind establishment of the MPA Indicator 4: Is the local community aware of the main rationale behind establishment of the MPA.		
Less than 26% of the local community is aware of the main rationale behind establishment of the MPA.	0	
From 26% to 50% of the local community is aware of the main rationale behind establishment of the MPA.	1	
Less than 51% to 75% of the local community is aware of the main rationale behind establishment of the MPA.	2	
More than 75% of the local community is aware of the main rationale behind establishment of the MPA.	3	

Criteria: Priority issues affecting the MPA Indicator 5: Does the local community rank one of the priority issues affecting the MPA as a threat?		
Less than 26% of the local community ranked one of the priority issues affecting the MPA as a threat.	0	
From 26% to 50% of the local community ranked one of the priority issues affecting the MPA as a threat.	1	
From 51% to 75% of the local community ranked one of the priority issues the MPA as a threat.	2	
More than 75%of the local community ranked one of the priority issues affecting the MPA as a threat.	3	
Criteria: MPA zoning categories. Indicator 6: Is the local community aware of the correct zoning categories of the MPA?		
Less than 26% of the local community is aware of the correct zoning categories of the MPA.	0	
From 26% to 50% of the local community is aware of the correct zoning categories of the MPA.	1	
From 51% to 75% of the local community is aware of the correct zoning categories of the MPA.	2	
More than 75% of the local community is aware of the correct zoning categories of the MPA.	3	
Criteria: Community participation Indicator 7: Did the local community participate or attend in an activity relating to the MPA management ?		
Less than 26% of the local community participated or attended in an activity relating to the MPA management (e.g. an awareness raising program, a training workshop, a field work)	0	
From 26% to 50% of the local community participated or attended in an activity relating to the MPA management	1	
From 51% to 75% of the local community participated or attended in an activity relating to the MPA management.	2	
More than 75% of the local community participated or attended in an activity relating to the MPA management	3	

Appendix E. The indicators used to assess the management effectiveness assessment of the Socotra Island MPA in terms of community satisfaction with the MPA management.

Criteria: General management Indicator 1: Is the local community satisfied with the overall management of the MPA?	Scores	Results
Less than 26% of the local community is satisfied with the overall management of the MPA.	0	
From 26% to 50% of the local community is satisfied with the overall management of the MPA.	1	
From 51% to 75% of the local community is satisfied with the overall management of the MPA.	2	
More than 75% of the local community is satisfied with the overall management of the MPA.	3	
Management element: '*Context'*		
Criteria: Community participation Indicator 2: Is the local community satisfied with its participation opportunity in MPA management-related activities?		
Less than 26% of the local community is satisfied with its participation/attendance opportunity in management-related activities.	0	
From 26% to 50% of the local community is satisfied with its participation/attendance opportunity in management-related activities.	1	
From 51% to 75% of the local community is satisfied with its participation/attendance opportunity in management-related activities.	2	
More than 75% of the local community is satisfied with its participation/attendance opportunity in management-related activities.	3	
Management element: '*Planning'*		
Criteria: Regulation adequacy Indicator 3: Is the local community satisfied with adequacy of current regulations for the MPA management?		
Less than 26% of the local community is satisfied with adequacy of current regulations for the MPA management.	0	
From 26% to 50% of the local community is satisfied with adequacy of current regulations for the MPA management	1	
From 51% to 75% of the local community is satisfied with adequacy of current regulations for the MPA management	2	
More than 75% of the local community is satisfied with adequacy of the current regulations for the MPA management	3	
Criteria: MPA design Indicator 4: Is the local community satisfied with the current zoning plan of the MPA?		
Less than 26% of the local community is satisfied with the current zoning plan of the MPA.	0	
From 26% to 50% of the local community is satisfied with satisfied with the current zoning plan of the MPA.	1	
From 51% to 75% of the local community is satisfied with the current zoning plan of the MPA.	2	
More than 75% of the local community is satisfied with the current zoning plan of the MPA.	3	

Management element: '*Inputs'*		
Criteria: Staff capacity Indicators 5: Is the local community satisfied with staff's skills to manage the MPA effectively?		
Less than 26% of the local community is satisfied with staff's capacity to manage the MPA effectively.	0	
From 26% to 50% of the local community is satisfied with staff's capacity to manage the MPA effectively.	1	
From 51% to 75% of the local community is satisfied with staff's skills to manage the MPA effectively.	2	
More than 75% of the local community is satisfied with the ability of the management authority to manage the MPA.	3	
Criteria: The Management Authority (MA) facilities Indicator 6: Is the local community satisfied with the MA facilities?		
Less than 26% of the local community is satisfied with the MA.	0	
From 26% to 50% of the local community is satisfied with the MA facilities.	1	
From 51% to 75% of the local community is satisfied with the MA facilities.	2	
More than 75% of the local community is satisfied with the MA facilities.	3	
Criteria: Awareness and education Programs Indicator 7: Is the local community satisfied with the awareness and education programs related to the MPA?		
Less than 26% of the local community is satisfied with the awareness and education programs related to the MPA.	0	
From 26% to 50% of the local community is satisfied with the awareness and education programs related to the MPA.	1	
From 51% to 75% of the local community is satisfied with the awareness and education programs related to the MPA.	2	
More than 75% of the local community is satisfied with the awareness and education programs related to the MPA.	3	
Management element: '*Process'*		
Criteria: Legislation enforcement Indicator 8: Is the community satisfied with enforcement of the legislations related to the MPA management?		
Less than 26% of the local community is satisfied with enforcement of the legislations related to the MPA management.	0	
From 26% to 50% of the local community is satisfied with enforcement of the legislations related to the MPA management.	1	
From 51% to 75% of the local community is satisfied with enforcement of the legislations related to the MPA management.	2	
More than75% of the local community is satisfied with enforcement of the legislations related to the MPA management.	3	
Criteria: The role of native people in decision making. Indicator 9: Is the local community satisfied with the role given to the native people in making decisions relating to the MPA management.		
Less than 26% of the local community is satisfied with the role given to the native people in making decisions relating to the MPA management.	0	
From 26% to 50% of the local community is satisfied with the role given to the native people in making decisions associated with the MPA management.	1	
From 51% to 75% of the local community is satisfied with the role given to the native people in making decisions relating to the MPA management.	2	

More than 75% of the local community is satisfied with role given to the native people in making decisions relating to the MPA management.	3	
Criteria: Information availability Indicator 10: Is the local community satisfied with available information on the MPA?		
Less than 26% of the local community is satisfied with available information on the MPA.	0	
From 26% to 50% of the local community is satisfied with available information on the MPA.	1	
From 51% to 75% of the local community is satisfied with available information on the MPA.	2	
More than 75% of the local community is satisfied with available information on the MPA.	3	
Criteria: Research and studies. Indicators 11: Is the local community is satisfied with research and studies conducted for the MPA?		
Less than 26% of the local community is satisfied with research and studies conducted for the MPA.	0	
From 26% to 50% of the local community satisfied with research and studies conducted for the MPA.	1	
From 51% to 75% of the local community is satisfied with research and studies conducted for the MPA.	2	
More than 75% of the local community is stratified with research and studies conducted for the MPA.	3	
Management element: '*Outputs*'		
Criteria: Public services. Indicator 12: Is the local community is satisfied with public services presented for the MPA?		
Less than 26% of the local community is satisfied with the public services presented for the MPA.	0	
From 26% to 50% of the local community is satisfied with the public services presented for the MPA.	1	
From 51% to 75% of the local community is satisfied with the public services presented for the MPA.	2	
More than 75% of the local community is satisfied with the public services presented for the MPA.	3	
Criteria: Services delivered to fishers. Indicator 13: Is the local community satisfied with the services delivered to fishers/locals?		
Less than 26% of the local community is satisfied with the services delivered to fishers/locals.	0	
From 26% to 50% of the local community is satisfied with the services delivered to fishers/locals.	1	
From 51% to 75% of the local community is satisfied with the services delivered to local/fishers.	2	
More than 75% of the local community is satisfied with the services delivered to fishers/locals.	3	
Criteria: Services presented for women in coastal areas. Indicator 14: Is the local community satisfied with the services presented for women in coastal areas?		

Less than 26% of the local community is satisfied with the services delivered to women in coastal areas.	0	
From 26% to 50% of the local community is satisfied with the services delivered to women in coastal areas.	1	
From 51% to 75% of the local community is satisfied with the services delivered to women in coastal areas.	2	
More than 75% of the local community is satisfied with the services delivered to women in coastal areas.	3	
Management element: '*Outcomes'*		
Criteria: The marine environment status. Indicator 15: Is the local community satisfied with the current marine environment status compared with it before declaring the MPA?		
Less than 26% of the local community is satisfied with the current marine environment status compared with its situation before declaring the MPA.	0	
From 26% to 50% of the local community is satisfied with the current marine environment status compared with its situation before declaring the MPA.	1	
From 51% to 75% of the local community is satisfied with the current marine environment status compared with its situation before declaring the MPA.	2	
More than 75% of the local community is satisfied with the current marine environment status compared with its situation before declaring the MPA.	3	
Criteria: The community livelihood. Indicator 16: Is the local community satisfied with the current livelihood status compared with it before declaring the MPA?		
Less than 26% of the local community is satisfied with the current livelihood status compared with it before declaring the MPA.	0	
From 26% to 50% of the local community is satisfied with the current livelihood status compared with it before declaring the MPA.	1	
From 51% to 75% of the local community is satisfied with the current livelihood status compared with it before declaring the MPA.	2	
More than 75% of the local community is satisfied with the current living status comparing with the status before declaration of the MPA.	3	
Criteria: Tourism activities. Indicator 17: Is the local community satisfied with the tourism activities?		
Less than 26% of the local community is satisfied with the tourism activities.	0	
From 26% to 50% of the local community is satisfied with the tourism activities.	1	
From 51% to 75% of the local community is satisfied with the tourism activities.	2	
More than 75% of the local community is satisfied with the tourism activities.	3	
Criteria: Benefits gained from the MPA. Indicator 18: Is the local community satisfied with its benefits gained from the MPA?		
Less than 26% of the local community is satisfied with its benefits gained from the MPA.	0	
From 26% to 50% of the local community is satisfied with its benefits gained from of the MPA.	1	
From 51% to 75% of the local community is satisfied with its benefits gained from the MPA.	2	
More than 75% of the local community is satisfied with the benefits gained from the MPA.	3	