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# COMMUNITY-LEVEL SOCIO-ECOLOGICAL VULNERABILITY ASSESSMENTS IN THE BENGUELA CURRENT LARGE MARINE ECOSYSTEM

# COMMUNITY-LEVEL SOCIO-ECOLOGICAL VULNERABILITY ASSESSMENTS IN THE BENGUELA CURRENT LARGE MARINE ECOSYSTEM

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## ABSTRACT

Climate change is considered one of the most critical challenges facing the planet and humankind. It poses a key threat to marine ecosystems and fisheries resources as well as communities that depend on these systems for food and livelihoods. Understanding the vulnerability of these socio-ecological systems to climate change, and their capacity to adapt, has become the focus of several climate change and fisheries projects and programmes in recent years. Increasingly, researchers and practitioners recognize that actions supporting adaptive capacity building have to be grounded in local needs and experiences and, thus, vulnerability assessments should be participatory and inclusive. A good understanding of local vulnerabilities, including local perceptions of the multiple drivers of change, historic and customary adaptation strategies, and existing capacity within local institutions and among individuals, should be used as building blocks for strengthening resilience and identifying appropriate adaptation strategies. Participatory vulnerability assessment is an approach that facilitates better understanding of the extent to which a socio-ecological system (e.g. coastal fishery system) is susceptible to various socio-ecological changes (including the effects of climate change) and the system's capacity to cope with and adapt to these changes from the viewpoint of the local communities. This analysis will help countries, partner agencies and their staff, researchers and fisheries professionals in understanding how to define and measure vulnerability within complex fisheries systems, using perception-based approaches within fishing communities in the Benguela Current region (Angola, Namibia and South Africa) as an example. Ultimately, the scope of this work is to improve resilience of fisheries systems and dependent communities to multiple drivers of change including climate change and ocean acidification.

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**ABBREVIATIONS AND ACRONYMS**

| | |
|---|---|
| BCC | Benguela Current Commission |
| BCLME | Benguela Current Large Marine Ecosystem |
| CBO | community-based organization |
| DAFF | Department of Agriculture, Forestry and Fisheries (South Africa) |
| DEA | Department of Environmental Affairs (South Africa) |
| DTI | Department of Trade and Industry (South Africa) |
| GDP | gross domestic product |
| GEF | Global Environment Facility |
| GEI | group of economic interest |
| GULLS | Global learning for local solutions: Reducing vulnerability of marine-dependent coastal communities |
| HAFA | Hanganeni Artisanal Fishing Association |
| IPA | Institute for Artisanal Fisheries (Angola) |
| IPCC | Intergovernmental Panel on Climate Change |
| IRP | interim relief permit |
| LDCF | Least Developed Countries Fund |
| MPA | marine protected area |
| NGO | non-governmental organization |
| RVA | rapid vulnerability assessment |
| SCCF | Special Climate Change Fund |
| SSC | Social Security Commission |
| TAC | total allowable catch |
| UCT | University of Cape Town |
| VMS | vessel monitoring system |
| WCRL | west coast rock lobster |

# 1. INTRODUCTION

Climate change is considered one of the most critical challenges facing the planet and humankind. It poses a key threat to marine ecosystems and fisheries resources as well as communities that depend on these systems for food and livelihoods. Small-scale fisheries have contributed little to the causes of climate change but will be among the first sectors to feel its impacts (Allison *et al*., 2005) There is a growing body of literature on the effects of climate change on the productivity of aquatic ecosystems as well as the distribution and productivity of particular fisheries (see for example Allison *et al*., 2005 and 2009; McClanahan *et al*., 2005 and 2007; Barsley, De Young, C. and Brugère, 2013; Cinner *et al*., 2013; Mamauag *et al*., 2013; Mills *et al*., 2013). Some anticipated consequences of climate change include falling productivity, species migration and localized extinctions, leading to increased conflict over the use of scarce resources. Moreover, increased risks associated with more extreme weather events such as increased frequency and severity of hurricanes, flooding and storm events are likely to have significant negative consequences on coastal fishing communities, which are already among the poorest and most marginalized people in the world (Alison *et al*., 2005). Understanding the vulnerability of these socio-ecological systems to climate change, and their capacity to adapt, has become the focus of several climate change and fisheries projects and programmes in recent years (Allison *et al*., 2009; Cinner *et al*., 2013; Mamauag *et al*., 2013; Mills *et al*., 2013).

However, the precise and localized impacts of climate change on fishery systems are still poorly understood (FAO, 2013). This is because the inherent unpredictability of climate change and the links that entwine fishery livelihoods with other livelihood strategies and economic sectors make unravelling the exact mechanisms of climate impacts hugely complex (FAO, 2013). This uncertainty means that adapting directly to the impact of climate change is difficult. Therefore, the focus must be on building adaptive capacity to shocks and change by improving the health of fish stocks, freshwater, marine and coastal ecosystems as well as the well-being and resilience of communities that depend on such systems.

The Benguela Current Large Marine Ecosystem (BCLME) is situated off the west and south coast of Africa between 5–37ºS, 0–26ºE and spans the three countries of Angola, Namibia and South Africa. It is one of the four major upwelling systems on the eastern boundaries of the Atlantic and Pacific oceans. The Benguela system is particularly productive in terms of fisheries resources and is one of the most productive marine ecosystems in the world. The Benguela system provides the resource base for a diverse number of fisheries, ranging from local subsistence to small-scale commercial (or artisanal) and includes a large-scale commercial sector in all three countries. In terms of the small-scale and subsistence sectors, fisheries resources provide a critical source of food for hundreds of thousands of households as well as contributing to livelihoods and employment for a significant number of coastal dwellers in the region.

In Angola, marine resources sustain a vast coastal population that depend on fishing and fishery-related activities for their food and livelihoods. Seafood is a staple source of protein for most of the human population in Angola's coastal regions. With the decline of agriculture during the civil war and its consequences (some of the countryside is still mined), fisheries and, to a lesser extent, aquaculture have become cornerstones of food security for major parts of Angola. Small-scale fishers in Angola are recognized by law, with a dedicated artisanal fishing zone for their exclusive use.

In Namibia, the fishing sector contributes about 5 percent to the national gross domestic product (GDP) and is almost entirely focused on the industrial sector. A recreational sector is also catered for. Small-scale fishers are not recognized by law, although several hundred operate informally or under the guise of recreational fishing. Their livelihoods and income are wholly dependent on these mainly shore-based recreational fishing activities (Sowman *et al*., 2011a).

In South Africa, until recently, most effort focused on developing and managing the commercial fishing industry, which mainly targeted hake, sardines, anchovy, rock lobster, squid, tuna and various line-fish resources. However, in the past ten years, increasing attention has been given to the small-scale fisheries sector, and a new policy that recognizes and protects this sector has recently been promulgated (DAFF, 2012). Small-scale fishers operating in the BCLME in South Africa mainly target west coast rock lobster (WCRL) and line-fish resources. Although the fisheries sector contributes less than one percent to South Africa's GDP, it is an important industry in the coastal provinces and a vital source of food, employment and income for coastal communities. While the new small-scale fisheries policy calls for a significant shift in approach to managing this sector, implementation[1] has not yet taken place.

The importance of fisheries to coastal livelihoods in the BCLME means that there is a high risk that changes and impacts on coastal systems, from pollution and overharvesting to those associated with climate change, will increase the vulnerability of local communities. Hampton (2011) found that the socio-economic impacts of environmentally induced changes, in particular resource availability and abundance, will be most felt in those fisheries in which a large number of people are heavily dependent on fish for food. These include the artisanal and semi-industrial pelagic fisheries in Angola, the WCRL in South Africa, as well as the various line-fisheries in southern Africa. Hampton (2011) therefore recommended that efforts be directed at working with coastal communities to identify and develop mitigation measures and adaptation strategies to respond to these changes and minimize their adverse consequences.

Increasingly, researchers and practitioners recognize that actions supporting adaptive capacity building have to be grounded in local needs and experiences and, thus, vulnerability assessments should be participatory and inclusive. A good understanding of local vulnerabilities, including local perceptions of the multiple drivers of change, historic and customary adaptation strategies, and existing capacity within local institutions and among individuals, should be used as building blocks for strengthening resilience and identifying appropriate adaptation strategies. In this regard, while it is important to understand people's vulnerability to potential climate change impacts, it is equally important to assess more broadly how people experience environmental and social changes. In reality, vulnerabilities to different socio-ecological stressors are intertwined and may exacerbate one another.

Participatory vulnerability assessment is an approach that facilitates better understanding of the extent to which a socio-ecological system (e.g. coastal fishery system) is susceptible to various socio-ecological changes (including the effects of climate change) and the system's capacity to cope with and adapt to these changes from the viewpoint of the local communities. One of its key purposes is to assist in identifying locally appropriate adaptation strategies that can be implemented. These vulnerability assessments should be designed in consultation with fishing communities to ensure that they take the local and regional specificities of fisheries into account, covering the whole value chain from harvesting to consumption, but also considering underlying drivers of poverty. The assessments should allow communities to identify potential threats, changes, strengths, opportunities and existing coping mechanisms and adaptation strategies. Gender roles and needs of the most vulnerable groups, e.g. female or child-headed households, older persons and youth, should be given special attention.

FAO and the Benguela Current Commission (BCC) identified the need to undertake this type of community-level vulnerability assessment in the BCLME region, and appointed researchers from the University of Cape Town to undertake this work in the course of 2014. The methodology developed in this project and the findings emanating from it will feed into the Global Environment Facility (GEF) Least Developed Countries Fund (LDCF) / Special Climate Change Fund (SCCF) project entitled: "Enhancing Climate Change resilience in the Benguela Current Fisheries System".

[1] For a comprehensive review of small-scale fisheries in the BCLME, see Sowman *et al*., 2011a and b.

## 1.1 Aim and objectives of the study

The overall aim of this study is to develop and apply a community-level vulnerability assessment, with a particular focus on understanding the effects of environmental variability and climate change, on selected coastal fishing communities within the BCLME region.

The specific objectives are:

1. To identify the key pressures and threats to the lives and livelihoods of coastal fishing communities in terms of their experiences and perceptions.
2. To explore and assess socio-ecological vulnerabilities of coastal fishing communities in relation to climate change and environmental variability including impacts of other sector activities that may exacerbate vulnerability.
3. To differentiate vulnerability across case studies and identify most vulnerable groups and sectors and reasons for this.
4. To identify and assess existing coping mechanisms and adaptation strategies that communities have employed to address socio-ecological vulnerabilities.
5. To propose measures and adaptation strategies to reduce vulnerabilities of small-scale fishing communities associated with and exacerbated by climate change that could be integrated into policies, programmes and plans at different levels.

The focus of this study was to develop and apply a community-level vulnerability assessment in selected fishing communities in the BCLME, with a view to extending the application of this tool to other community sites in the BCLME in the next phase of work under the GEF project. At the outset of the study, it was agreed that the vulnerability assessment methodology developed for this study should be participatory, easy to apply, able to be conducted over a relatively short period, and require limited resources. The team thus focused on developing a rapid vulnerability assessment (RVA) tool that could be applied in fishing communities in the BCLME. Hence, the findings are largely based on information derived from a two-day community workshop in each locality and follow-up focus group meetings and/or key informant interviews conducted on the third day. Time and budget constraints allowed about three days in each community. In the communities where the research team had previously worked, the analysis was informed by an existing understanding of the socio-ecological and governance context, and thus the findings and proposed adaptation strategies are more detailed and specific.

## 2. CONCEPTUAL REVIEW TO INFORM THE RVA APPROACH

In order to inform the development of a vulnerability assessment methodology for fishing communities in the BCLME, the first task was to undertake a review of vulnerability assessment methodologies employed in various sectors (e.g. forestry, water and fisheries) with special attention given to methodologies that focused on vulnerability to climate change in the fisheries and aquaculture sectors (*inter alia* Brugère and De Young, 2015; Barsley, De Young and Brugère, 2013; Cinner *et al*., 2013; Mamauag *et al*., 2013; Manandhar, Pandey and Kazama, 2013; Mills *et al*., 2013). The intention was to identify the principles, broad approaches, and key activities that should guide a participatory community-level vulnerability assessment – but one that could be conducted over a relatively short period of time and with limited resources – a so-called "rapid vulnerability assessment" (RVA).

The concept of vulnerability has become a central theme in the climate and development debate and is fundamental to understanding and responding to socio-ecological system changes, including climate change (Adger, 2006; Preston, 2012; Tschakert *et al*., 2013). The assessment of vulnerability has become a popular tool to help shape understanding and awareness of the impacts of climate change. The intention is that an understanding of the vulnerability of individuals, communities and systems to climate change and its associated impacts should guide the development of adaptation responses and decision-making for sustained societal benefit. Importantly, by understanding vulnerability to climate variability and change, and associated impacts, strategies could be developed and actions taken to reduce these impacts. Despite this realization, little attention has been devoted to understanding the opportunities and challenges of vulnerability assessments as a means of facilitating climate change adaptation (Preston, 2012).

This review briefly explores the conceptual foundations of vulnerability, before reflecting upon how vulnerability and adaptation have been formulated in relation to the challenges arising from the impacts of climate change in the coastal fishing environment. The review then assesses the strengths and weaknesses of vulnerability assessment approaches, methodologies and frameworks. In conclusion, cognizant of the contextual requirements of small-scale fisheries on the southwest coast of Africa, this literature review considers the best practice vulnerability assessment principles and approaches that should be applied in selected small-scale fishing communities of the BCLME.

### 2.1 Vulnerability and vulnerability assessments

The concept of "vulnerability" encapsulates the potential for adverse consequences to occur in response to a range of exogenous or endogenous factors, including climate change. It is a complex and multifaceted concept with little agreement across disciplines with regard to how it should be understood, characterized and studied (FAO, 2015a). "Risk" incorporates the concept of consequences or adverse outcomes, but introduces elements of probability as well. "Resilience" is another concept relevant to vulnerability studies and is defined as "the magnitude of disturbance that can be absorbed or buffered without the system undergoing fundamental changes in its functional characteristics" (Berkes, Colding and Folke, 2003). Resilience thus incorporates characteristics of adaptability, learning and self-organization.

Vulnerability assessments are conducted in various disciplines and for a variety of reasons, including enhancing understanding of vulnerability contexts and drivers of vulnerability, in order to improve planning and design, and identify appropriate policy interventions. In the context of climate change and development, a strong focus would be on the delivery of relevant knowledge to improve adaptation planning and action. Before initiating a vulnerability assessment, it is necessary to clarify a few questions:

- At what scale will the assessment take place – international, national, regional or local?
- Who or what is vulnerable – an ecosystem, species, an individual, communities or a nation?

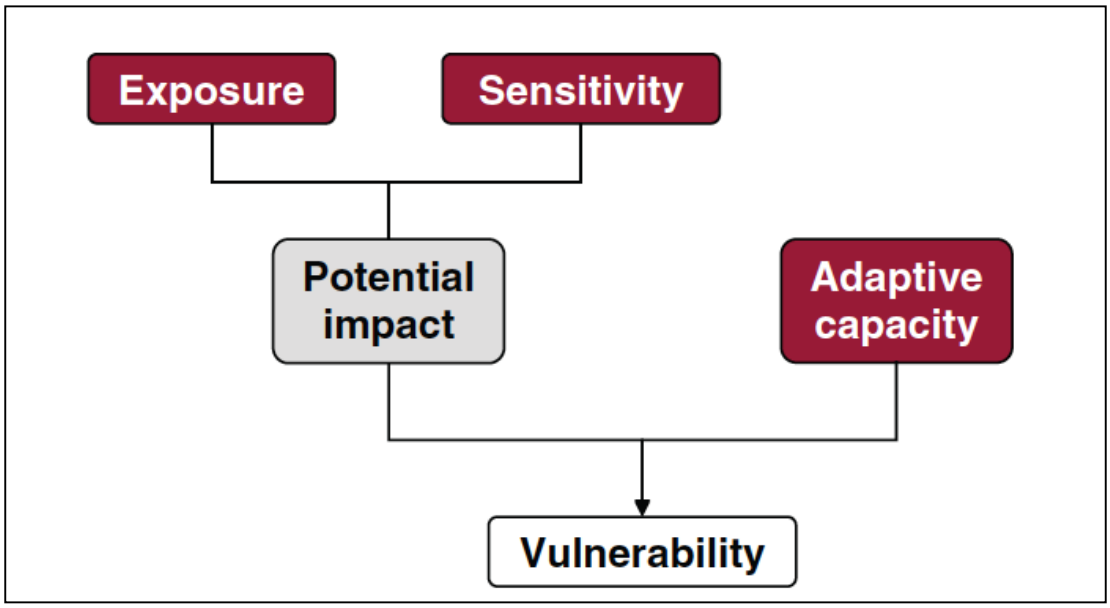
- Researchers or practitioners must ask the question – vulnerable to what?

In the context of this study, the focus is on improving understanding of the communities' vulnerability from a socio-ecological context, with a particular interest in system changes that may be linked to environmental variability and climate change. A further key issue in any vulnerability assessment is to explore how vulnerability can be reduced, and in the context of human populations, identity what adaptation strategies and adaptive capacity are required in order to deal with stressors and address change.

Figure 1 shows the commonly used framework for assessing vulnerability to climate change, as adopted by the Intergovernmental Panel on Climate Change (IPCC). In the context of fisheries, exposure relates to the influences or stimuli that impact on a species or system, and represents the background climate conditions, and any changes in those conditions. Sensitivity reflects the responsiveness of a species or system to climatic influences, and the degree to which changes in climate affect current form. Together, these determine the potential impacts that a species or system experiences, which will be tempered by its adaptive capacity; that is, the ability of a species or system to adapt to or reduce the consequences of climate change (Johnson and Welch, 2010). While the IPCC framework provides a useful conceptual framework and is the starting point of many vulnerability assessments, various shortcomings have been identified, in particular in relation to consideration of socio-economic, cultural and governance dimensions, as well as the perceptions of local resource users and other stakeholders to climate change and its possible effects.

**Figure 1**

**Commonly used IPCC framework for assessing vulnerability to climate change**




*Source:* Johnson and Welch (2010).

The past 40 years have seen a vast amount of research and development in the field of vulnerability to climate change. Its initial development emerged from the natural hazards discipline (White and Haas, 1975) with much focus on natural hazards, while neglecting the vulnerability context and adaptive capacity (Eakin and Luers, 2006). However, as understanding of the concept of vulnerability has increased, greater attention has been devoted to understanding vulnerability from a more holistic socio-ecological perspective, recognizing that socio-ecological systems are often already vulnerable to a variety of drivers and that climate change is an additional driver of change and stress to that system. Thus, it is usually difficult to attribute a given driver of change (e.g. increased sea surface temperature) to perceived or science-based evidence of change given the current state of knowledge, the limited

understanding of the linkages within these complex systems, and the cumulative impacts of different drivers of change (FAO, 2015a). As a consequence of the limits to the predictability of future climate change, an increasing emphasis has been placed on understanding and reducing social and ecological vulnerability rather than increasing efforts to quantify indicators of climate change (Preston, 2012).

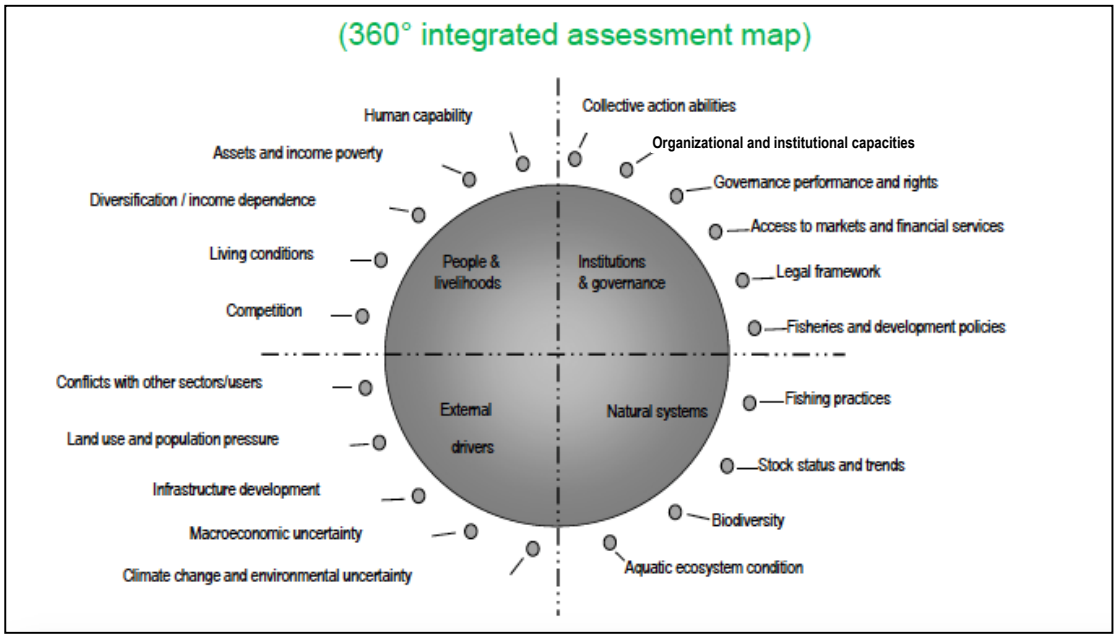
Adger *et al*. (2004) have recognized two broad classes of vulnerability. They include vulnerability to: (i) biophysical determinants (e.g. climatic conditions, topography, land cover, primary productivity, and natural hazards); and (ii) socio-economic determinants (e.g. population density, poverty, trade, employment, gender, and governance). However, given that concepts of social and human well-being are socially constructed, identification and assessment of these dimensions in relation to adaptation to address vulnerability is challenging. Preston (2012) identified a number of vulnerability assessments that attempt to consider social, economic and environmental values in their approaches, but notes that despite this growth of "triple bottom line" frameworks, cultural values are largely neglected in vulnerability assessments.

The latter understanding conceptualizes vulnerability as inherent to a social system, i.e. social conditions, historical circumstances and the political economy of groups. This understanding of vulnerability is sometimes referred to as "contextual vulnerability". However, climate change impacts will interact with changes in demographics, markets, technology, social pressures and many other factors that cannot always be anticipated. Contextual vulnerability will thus affect the ability of a community to cope with and adapt to change, whether social or environmental.

Figure 2 shows a useful conceptual framework for understanding fisheries or the fishery system. Introduced by Garcia *et al*. (2008) in an effort to provide an integrated assessment framework for small-scale fisheries worldwide, this framework was further refined by Mills *et al*. (2011) to assess vulnerability and resilience. The framework includes a range of different elements that need to be considered in order to understand the vulnerability of a fishery system. It provides a broad framework that can be used to assess vulnerability at different scales. The framework is particularly useful as it defines vulnerability as inherent to a small-scale fisher, his/her household or the community. Moreover, it allows the researcher to assess vulnerability to different social and ecological stressors, and map out linkages between these factors, i.e. influence of one factor on another. Figure 2 provides a diagram of this framework, also referred to as the "360° degree integrated assessment map".

**Figure 2**

**Integrated vulnerability assessment framework**




*Source:* Mills *et al* (2011).

## 2.2 Adaptation

Adaptation to climate change has been characterized by Adger *et al*. (2007, p. 720) as taking place "through adjustments to reduce vulnerability or enhance resilience in response to observed or expected changes in climate and associated extreme weather events". Adaptation therefore has ecological, physical and human dimensions and is conceptually linked with the IPCC conceptualizations of vulnerability and resilience, wherein change in ecological, physical and social processes can reduce potential damages or realize new opportunities. Adaptation involves a flux of social and environmental processes that change the socio-ecological system's functioning to reduce impacts. As Barsley, De Young and Brugère state (2013, p. 3): "The main purpose of vulnerability analysis is to improve targeting and effectiveness of adaptation actions."

Climate change presents a novel risk to the ways that societies have conventionally adapted. Specifically, adaptation to climate change includes the notion that people can adapt in anticipation of climate change, given the climate model projections. Adapting in anticipation of change is particularly challenging to individuals who want certainty about future change. Natural systems can only adapt in reaction to experienced change. Although adapting in anticipation to change is challenging given that people are more likely to respond after experiencing impacts, many decisions implemented now will be undermined if long-term climate change is not considered (Hallegatte, 2009).

According to Adger *et al*. (2007), adaptation has the potential to make positive use of new opportunities created by climate change, as well as reduce its negative impacts. Yet, it is important to consider the limitations of adaptation. Such limits are influenced by the magnitude and rate of climate change as well as financial, institutional, technological, cultural and cognitive barriers (Alam *et al*., 2014). Moreover, the capacities for adaptation are not consistent within a population. Adaptive capacity varies across and within communities, countries, regions and sectors (Smit and Wandel, 2006). Societies often contain individuals with insufficient capacity to adapt in general or to climate change specifically. The "capacity to adapt is dynamic and influenced by economic and natural resources, social networks, entitlements, institutions and governance, human resources, and technology" (Adger *et al*., 2007, p. 719).

Beyond the conceptual understanding of adaptation, Adger *et al*. (2007, p. 719) consider the implementation of adaptation measures in both developing and developed countries, and suggest that climate change adaptation measures are seldom implemented in response to climate change alone. Therefore, it is important to consider broader sectoral initiatives within which climate change adaptation can be incorporated.

Adger *et al*. (2007) call for adaptation research to consider monitoring progress in adaptation, considering trade-offs between various adaptation measures and the resilience of socio-ecological systems to climate change. They also motivate that such research consider the non-market costs and benefits of adaptation measures, especially those that lead to implications for the sustainability-oriented livelihood coping strategies of communities.

The IPCC (2014, p. 23) suggests that initial steps towards adaptation to future climate change can be identified in the following three areas:

1. Reducing vulnerability and exposure to present climate variability.
2. Recognition of diverse interests, circumstances, social-cultural contexts, and expectations and that can benefit decision-making processes. Indigenous, local, and traditional knowledge systems and practices, including indigenous peoples' holistic view of community and environment, are a major resource for adapting to climate change, but these have not been used consistently in existing adaptation efforts. Integrating such forms of knowledge with existing practices increases the effectiveness of adaptation.
3. Decision support is most effective when it is sensitive to context and the diversity of decision types, decision processes, and constituencies (robust evidence, high agreement). Organizations bridging science and decision-making, including climate services, play an important role in the communication, transfer and development of climate-related knowledge, including translation, engagement, and knowledge exchange (medium evidence, high agreement).

### 2.3 Approaches to and methodologies for vulnerability assessments – review and discussion

Turner *et al*. (2003, p. 8074) identified three typologies of vulnerability assessment models that take different approaches although there are many variations of these. The three include "risk–hazard", "pressure-and-release" and "expanded vulnerability" models. Risk–hazard models emphasize exposure to biophysical drivers and hazards, and the sensitivity of exposed systems to those hazards. Relevant hazards often include sea-level rise, floods or extreme weather events. Meanwhile, sensitivity may be represented by the relative density of exposed assets such as population or development density. These approaches tend to be more quantitative and draw on the physical sciences. The pressure-and-release model focuses on social groups and the conditions that make their exposure unsafe, including the causes of these conditions (Blaikie *et al*., 1994). Pulling these two models together, Turner *et al*. (2003) propose the expanded vulnerability model that helps to advance sustainability by using a systems lens that looks across space and time.

Barsley, De Young and Brugère (2013) identified that there is a significant degree of confusion and debate surrounding vulnerability assessments and the methods through which vulnerability should be measured. Vulnerability has proved difficult to measure quantitatively as well as compare between different groups and locations. In their review, Alwang, Siegel and Jorgensen (2001) concluded that it would be difficult to establish an aggregated measurement of vulnerability owing to the multitude of and differences between its component disciplines and their respective approaches and methods that draw from economics, geography, sociology and anthropology, disaster management, environmental science, health and nutrition. Comparisons between vulnerability assessments are therefore challenging, especially if there are significant conceptual or scale differences regarding what or who is vulnerable and to what the vulnerability is oriented.

Despite the conceptual divergence in methodological direction, there is a generally shared principled agreement that vulnerability assessment can play an important role in the design of appropriate adaptation and mitigation policies and strategies to address the impacts of climate change (Barsley, De Young and Brugère, 2013). Vulnerability assessments need to incorporate both quantitative and qualitative data, as well as emphasizing the coupled human–environment systems in analysis. The complexity entailed in incorporating and evaluating various geographical, spatial, temporal and social dimensions of vulnerability has resulted in a multitude of different methodologies for measuring vulnerability (Barsley, De Young and Brugère, 2013; Eakin and Luers, 2006).

Furthermore, vulnerability assessment, and any metrics or inferences that arise out of it, are constructs fashioned by those individuals and institutions that participate in the assessment process. If participation of locals is undertaken in a meaningful way, it allows for local problem framing and locally relevant selection and application of frameworks, methods and tools. Thus, community engagement is instrumental to the translation of assessment results into action. Stakeholders that play these various roles contribute their own suite of inputs and processes to an assessment and seek to fulfil one or more individual or societal goals. Omission of certain stakeholders and key assessment roles can undermine the assessment or re-orient the assessment to unauthentic determinants. Hence, a robust assessment is contingent upon the recruitment of all relevant stakeholders into the process and ensures an effective balance of roles (McCall, 2003; Corbett, 2009).

Participatory assessments thus help assessors draw on stakeholder knowledge and values to aid in defining the system of interest and overcoming the common challenges that arise in assessment design and implementation. Importantly, participation helps to ensure procedural justice in the assessment process. Through participation and engagement, stakeholders have an opportunity to deliberate over information and potential courses of action. This promotes both individual ownership of the problem (and possible solutions) while facilitating collective action among individuals (Preston, 2012).

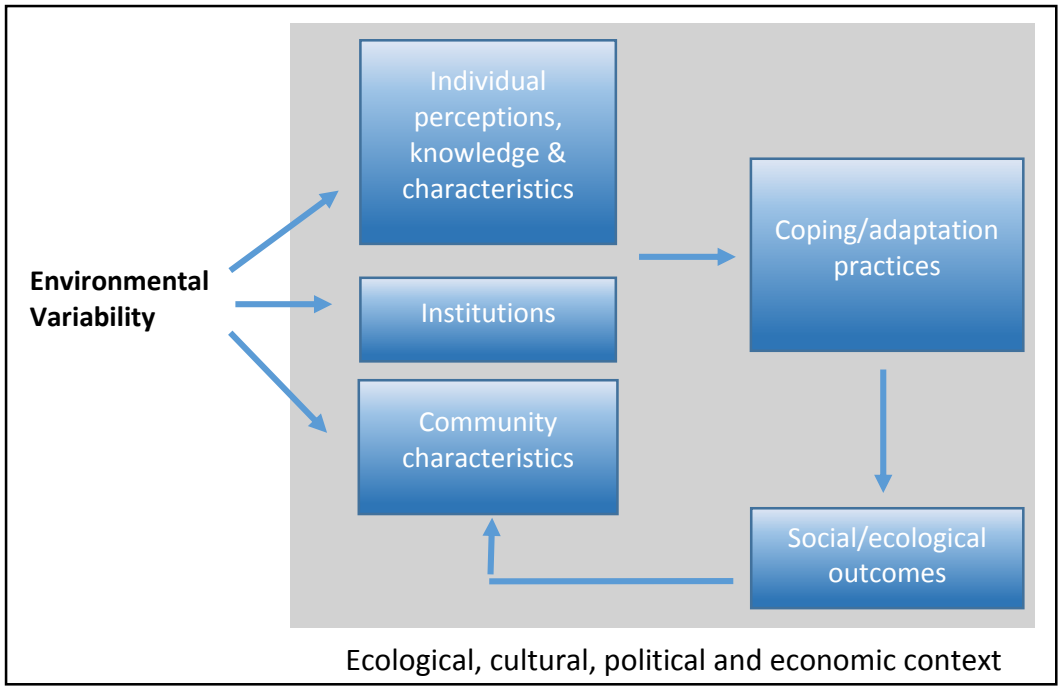
Preston (2012) identified a fourth type of assessment model, adding to the three described by Turner *et al*. (2003), which he calls the "social vulnerability / adaptive capacity" model, that focuses specifically on the capacity of sectors, regions or communities to cope with and adapt to climate variability and change. These models, which draw heavily on the social sciences, tend to build on a more qualitative understanding of the vulnerability context as well as the drivers of change, and consider linkages across components in, and drivers affecting the system. Although in the minority (see Section 2.3.3), these types of vulnerability assessments emphasize the fact that physical environmental drivers and hazards are one component of vulnerability, but the ultimate outcomes associated with such physical processes are quite often dependent upon the socio-economic context in which these processes occur (Hilhorst and Bankoff, 2004).

More recently, a number of vulnerability assessments and frameworks have broadened the research agenda to incorporate elements not conventionally included within vulnerability assessments, covering themes such as power, gender, food security, poverty, globalization, governance and management, trade and perceptions (Barsley, De Young and Brugère, 2013; Tschakert *et al*., 2013). An increasing number of vulnerability assessments are incorporating gender dimensions and encouraging a wider adoption and mainstreaming of gender-based studies in the field of climate change and vulnerability (see Seager and Hartmann, 2005). The increased focus on gender considerations has been motivated by research in developing countries that suggests that women are predominantly found to have a higher degree of vulnerability to climate change, a situation that is argued by many to be a result of the socio-economic structures that cause gender inequality in a large number of countries. The studies indicate a range of methods for assessing and measuring gender-based vulnerability, highlighting the importance of measuring male as well as female vulnerability (Barsley, De Young and Brugère, 2013).

A number of vulnerability assessments place a great deal of emphasis on the perceptions of individuals, household members and communities to the drivers of change and how these drivers affect their vulnerability context. The ways in which people perceive vulnerability can be dramatically different owing to the wide diversity of social, economic and political factors that vary between and within communities, individuals and groups (see O'Brien *et al*., 2004; Dow *et al*., 2007). The importance of understanding perceptions of vulnerability has been identified as a crucial aspect of vulnerability assessments, and one that can be invaluable for creating effective adaptation strategies and methods of vulnerability reduction (Barsley, De Young and Brugère, 2013).

In this regard, the recent work by Sievanen (2014) to assess fishers' adaptation to environmental variability in Baja California is particularly relevant. Fishers continuously confront multiple environmental and social stressors that necessitate changes in their behaviour, livelihoods and collective action. However, fishers' capacity to cope with and adapt to these changes not only depends on their individual or collective capital, but also on their perceptions and knowledge of these changes. Figure 3 presents a conceptual framework that integrates "perceptions and knowledge" in the process towards adaptation.

**Figure 3**
**Conceptual framework illustrating how fishers adapt to environmental variability**




Source: Sievenan (2014)

The following section provides a summary of the three main categories of vulnerability assessment approaches and methodologies.

### *2.3.1 Index-based and quantitative vulnerability assessments*

This category of assessments is characterized by quantitative and statistical approaches that are concerned with assessing probability of risk occurring and are commonly used in the risk–hazard models of vulnerability assessment. Indicator-based methodologies (Box 1) also fall within this category and are used as a means of measuring vulnerability and producing measurable outputs, including vulnerability maps and indices of vulnerability. However, they are not without their limitations (Barsley, De Young and Brugère, 2013). Some of the challenges of using indicator methodologies include the common inability to capture change over time, potential for loss of heterogeneity, limitations with data availability and the scale at which they are used, as the complexity of vulnerability cannot easily be fully represented by

the use of indicators (Tschakert *et al*., 2013). However, despite these challenges, indicators still provide one of the most dominant ways of measuring some elements of vulnerability and they continue to evolve and develop complexity, as shown in the following methodologies.

An example of a quantitative approach to vulnerability assessment is provided by Adger *et al*. (2004). Those authors focus on the development of new vulnerability and adaptive capacity indicators through a comprehensive analysis of vulnerability and the creation of a working database for socio-economic indicators to vulnerability from climate change. Through the use of literature reviews, practitioner meetings and discussions with key individuals, a conceptual framework was developed, from which indicators for vulnerability and adaptation were identified. Predictive indicators were developed along with proxy variables of vulnerability before the identification of indicators began. The authors found the key areas of health and social capital as being inadequately represented in previous vulnerability studies, and along with indicators of education and governance, they highlighted their usefulness in assessing vulnerability to climate hazards (Barsley, De Young and Brugère, 2013).

*Box 1*

*Vulnerability of national economies to the impacts of climate change on fisheries*

In this first global analysis of vulnerability of the fisheries sector, Allison *et al*. (2009) compare the vulnerability of 132 national economies to potential climate change impacts on fisheries using an indicator-based approach. Drawing on the IPCC framework of vulnerability, the authors identified countries that are highly exposed to climate-related hazards, and where livelihoods and economies are highly sensitive to climate variability and change such as fisheries and forestry, and where adaptation is constrained by limited resources and capacity. The authors selected measures of exposure, sensitivity and adaptive capacity that they considered would best reflect the drivers of interest, based on documented vulnerability studies. Selection of indicators was influenced by data availability, relevance of the data, and how recent the data were. Various indicators were identified; one for exposure (air surface temperature), a composite indicator for sensitivity (where indicators represented sensitivity of the economy to potential climate change impacts of the fisheries sector such as landings and contribution of fisheries to employment), while adaptive capacity was represented by a composite indicator comprising life expectancy, education, governance and size of the economy. Relative vulnerability rankings were calculated for 132 countries although 60 were excluded owing to lack of data. The vulnerability scores were considered robust to different methods of calculation as different methods of calculation had little effect on rank order of vulnerability scores. Based on this study, the relative vulnerabilities of national economies to the impacts of climate change on their fisheries and aquaculture sectors could be ascertained and represented graphically on a world map.

### *2.3.2 Community-level vulnerability assessments*

Vulnerability assessment methodologies have been applied at varying scales, such as the community (Box 2), subnational, national, regional and international. Community-based vulnerability assessments have mainly used stakeholder-based methodologies for conducting analysis of vulnerability at a local level, with a wide range of research tools such as participatory rural appraisals, focus groups, Delphi methods, questionnaires and surveys being used to capture qualitative and quantitative data. A variety of authors (Devisscher *et al*., 2011; Mills *et al*., 2011) argue for the need to conduct vulnerability assessments at the community level in order to capture the required richness of data to assess vulnerability and the local and community scale, taking into account local variations and perceptions on vulnerability. Assessments at the community level can often complement larger-scale assessments and are essential for planning local adaptation. Ideally, the outcomes of community-based assessments are fed into local programmes or policies of adaptation, with stakeholders often being consulted regarding the findings of the assessment (Barsley, De Young and Brugère, 2013).

*Box 2*

*Community-scale index-based vulnerability assessment*

An example of a community-scale index-based methodology is exemplified by the work of Cinner *et al*. (2011 and 2013) that use a nested socio-ecological assessment of vulnerability, based on the IPCC vulnerability assessment framework, to coral reef bleaching events in East African reef-dependent communities. As a first step, ecological vulnerability of the coral reef system, including fish, is modelled through oceanographic surveys, estimating the exposure of the system to coral bleaching (predicted levels of bleaching), ecological sensitivity (e.g. the degree to which coral species present are susceptible to bleaching) and adaptive capacity (e.g. factors affecting recruitment of new young corals). This ecological vulnerability can be considered the exposure experienced by the social system. Social vulnerability is then understood as a combination of this exposure plus social susceptibility (e.g. how reliant a community is on coral reef resources) and social adaptive capacity (e.g. resources and conditions that facilitate development of alternative livelihoods). A variety of tools were used to gather information for the estimated indicators: (i) applying multivariate models of coral bleaching impact to global oceanographic data to determine exposure; (ii) conducting underwater ecological surveys of coral, fish, habitat and algal production and grazing as indicators of ecological sensitivity to, and recovery potential from, bleaching in both fished and protected areas; and (iii) carrying out household- and community-level surveys of adjacent communities, interviewing key informants and obtaining detailed fisheries data on gear types and catch composition to derive indicators of social sensitivity to fisheries impacts and adaptive capacity. The authors found important variability between and within countries, and recommended specific temporal and spatial policy actions to reduce vulnerability at a specific location. The authors compared their findings with the index-based work of Allison *et al*. (2009) finding similarities at the national level. They argue that the coral-reef-based methodology can be applied to other threats and socio-ecological systems.

### *2.3.3 Towards more holistic and participatory vulnerability assessments*

Despite the popularity of index-based vulnerability assessment methodologies, there is also a strong motivation for more qualitative and participatory approaches to vulnerability assessment (Box 3), or a combination of the two (Preston, Yuen and Westaway, 2011; Tschakert *et al*., 2013). These vulnerability assessment methodologies take the socio-ecological system as the starting point and incorporate a range of human dimensions, including social, cultural, economic and governance dimensions. These approaches recognize the importance of understanding local perceptions of vulnerability and change and regard these inputs as critical to identifying appropriate adaptation strategies.

In a substantial review of 81 vulnerability assessments, Preston (2012) revealed a number of strengths and weaknesses in the emerging vulnerability assessment practice. The two most significant benefits of more participatory assessments are: "a) the opportunities it provides stakeholders to learn by contributing to the assessment process and engaging in collaborative discussions with other stakeholders, and b) developing an integrated view of biophysical changes in the environment in the context of socio-economic conditions and trends" (Preston, 2012, p. 4). Such approaches ensure that those affected by change are integrally involved in assessing their own vulnerability, exploring how vulnerability is likely to change over time, and identifying and prioritizing appropriate mitigation and/or adaptation strategies and measures. Moreover, attention given to social dimensions ensures that local experiences and perceptions are captured and incorporated into the assessment.

Despite the recognized value of participatory approaches, limited stakeholder participation was identified as a regular shortcoming in practice. Of the 81 vulnerability assessment studies analysed by Preston (2012), less than 40 percent integrated some form of stakeholder engagement in the appraisal procedure. In such cases, vulnerability assessments are restricted

to an academic exercise and fall short of providing social learning and locally driven adaptation opportunities (Preston, 2012; Tschakert *et al*., 2013).

Box 3

*Participatory vulnerability assessments in the fisheries sector*

Small-scale fisheries vulnerability assessments are predominantly undertaken at stakeholder and community level. These tend to capture the level of detail and data that may not be represented at the national or regional scale. Mills *et al*. (2011) focused on two pilot studies completed in the Niger River of Mali and on the shore of Lake Kainji in Nigeria. This research specifically identified the vulnerability of small-scale fishery-dependent communities. Ninety households in Mali and 40 in Nigeria were randomly selected for analysis, with various participatory methods being used to identify the key factors of vulnerability that affect people's livelihoods. Specific demographic variables such as socio-economic background, household income, assets and livelihood strategies were included in the surveys. A ranking system was also used in the research, with stakeholders asked to rank their main vulnerabilities. The benefit of conducting the two case studies was that it enabled a comparison across the two study sites, and highlighted differences and similarities between them, such as the variation in vulnerability between fishers and non-fishers. This information was useful and assisted policy-makers in identifying appropriate policy interventions.

In their critique of vulnerability assessments, Tschakert *et al*. (2013) suggest that it is necessary to move beyond focusing on the most vulnerable groups to actually understand structural vulnerability and the reasons why certain groups are more vulnerable than others. In order to capture an understanding of people's perceptions and their ability to respond to change, they argue that participatory processes are needed. Extensive participatory processes not only engage stakeholders in the vulnerability assessment but provide the opportunity for social learning that facilitates agency and action (Tschakert *et al.*, 2013). This, coupled with addressing inequity at multiple scales, can help to move towards transforming the system into a better-adapted system that builds adaptive capacity (Tschakert *et al*., 2013).

This review has highlighted that vulnerability is a complex and multifaceted concept. Thus, any vulnerability assessment needs to ensure that the methodology employed is appropriate to the purpose of the exercise and the context. While many methodologies exist, for the purposes of this study it was agreed that the vulnerability assessment methodology developed would adopt a holistic socio-ecological systems approach, take place at the community level, and be participatory and responsive to the local context. The findings emanating from the assessment, in particular the adaptation strategies identified by participants, would be followed up in a subsequent phase of this broader vulnerability work concerned with enhancing resilience of small-scale fisheries to climate change in the BCLME.

## 3. CLIMATE CHANGE AND SMALL-SCALE FISHERIES

Fisheries support economies and important social structures in many nations, particularly developing nations (Allison *et al*., 2009). Marine fisheries are under increasing threat from climate change, with climate change now identified as the latest threat to the world's fast declining fish stocks (UNEP, 2008; Cochrane *et al*., 2009). Allison *et al*. (2009) caution that marine fisheries will be exposed to increasing sea surface temperatures, ocean acidification, sea-level rise, increasing storm intensity and altered ocean circulation, and rainfall patterns that will affect target species through a range of direct and indirect mechanisms. The sensitivity of fish stocks to these changes will determine the range of potential impacts to life cycles, species distributions, community structure, productivity, connectivity, organism performance, recruitment dynamics, prevalence of invasive species, and access to marine resources by fishers. There are claims that many fisheries are already experiencing changes in target species diversity and abundance, species distribution, and habitat area, as well as loss of fishing effort owing to intensifying storms (Hobday *et al*., 2011; Pörtner *et al*., 2014).

Johnson and Welch (2010) argue that marine fisheries are significantly at risk from climate change as their fish stocks experience high ecological impact owing to their high exposure and sensitivity to changing ocean climate. For marine systems, the key concerns[2] that those authors summarize are:

- Global marine-species redistribution and marine-biodiversity reduction in sensitive regions will change the sustained provision of fisheries productivity and other ecosystem services (high confidence).
- Spatial shifts of marine species owing to projected warming will cause high-latitude invasions and high local-extinction rates in the tropics and semi-enclosed seas (medium confidence).
- Species richness and fisheries catch potential are projected to increase, on average, at mid- and high latitudes (high confidence) and decrease at tropical latitudes (medium confidence).
- Climate change adds to the threats of overfishing and other non-climatic stressors, thus complicating marine management regimes (high confidence) (IPCC, 2014, p. 16).

According to Mamauag *et al*. (2013, p. 9): "Impacts on fisheries such as increasing human population growth, overfishing, and changes in land use will be greater than the effects of climate, but the pressures are strongly interrelated." It is thus very difficult to discern the impacts that are caused or enhanced by climate change and what impacts are as a result of other factors owing to the complexity and inter-relatedness of climate change and environmental variability.

Allison *et al*. (2005) have identified that the countries that are most vulnerable to climate change in the fishing sector are in west and central Africa. Johnson and Welch (2010) stress that African nations are particularly vulnerable because of their high sensitivity, owing to nutritional dependence on fish, their semi-arid climate increasing their exposure to future temperature rise, rainfall declines, coastal flooding and storm surge, and their low capacity to adapt to change owing to weak economic and social development indices.

As such, small-scale fisheries in particular are predicted to be one of the most vulnerable groups with regard to climate change, although they have no implication in its cause (Allison *et al*., 2005). They are already considered a vulnerable group owing to the profusion of existing pressures. In addition to the risk related to fisheries, small-scale fishing communities are located in coastal systems that are in themselves vulnerable to climate change impacts. Coastal systems and low-lying areas have been identified as particularly at risk to the impacts of climate change:

[2] The degree of confidence in the validity of each statement is indicated where appropriate.

- Owing to sea-level rise projected throughout the twenty-first century and beyond, coastal systems and low-lying areas will increasingly experience adverse impacts such as submergence, coastal flooding, and coastal erosion (very high confidence).
- The population and assets projected to be exposed to coastal risks, as well as human pressures on coastal ecosystems, will increase significantly in the coming decades owing to population growth, economic development, and urbanization (high confidence).
- The relative costs of coastal adaptation vary strongly among and within regions and countries for the twenty-first century. Some low-lying developing countries and small island States are expected to face very high impacts that, in some cases, could have associated damage and adaptation costs of several percentage points of GDP (IPCC, 2014, p. 16).

In conclusion, Johnson and Welch (2010) argue that assessing fisheries' vulnerability to climate change is essential in order to prioritize systems in greatest need of intervention. Building on this is a need to understand the drivers of vulnerability to identify future research directions and, more importantly, to review current fisheries management with the view to develop management responses that will be effective in securing the future sustainability of marine fisheries.

# 4. METHODOLOGY

## 4.1 Development of a rapid vulnerability assessment

The review of current literature on vulnerability to climate change and different vulnerability assessment methodologies has informed the development of a rapid vulnerability assessment (RVA) methodology that is considered appropriate to the context of small-scale fisheries and fishing communities in the BCLME.

In addition to the call for more grounded and participatory vulnerability assessments to be conducted, it was deemed essential to take a holistic approach to the study and understand stressors and vulnerabilities linked to the local ecological context, the fishers' socio-economic circumstances, and the governance setup within which the fishers operate. Moreover, it was considered important to ascertain fishers' perceptions with regard to the impacts of various stressors, their possible causes as well as changes observed and perceived. Hence, particular attention was given to capturing and exploring fishers' perceptions of change, and unpacking which linked socio-ecological factors could be influencing these perceptions.

Furthermore, within the context of the changes within the BCLME, it is important to consider that many studies describe fishers' adaptation or quantify fishers' adaptive capacity to environmental/climate change. However, these changes are often events (e.g. coral bleaching, El Niño Southern Oscillation, storm surges, etc.). From the scientific information available (see Section 6.1.4), it is clear that climate variability/change impacts in the BCLME are typically more subtle. Indeed, fishers may not even perceive the effects of environmental change when compounded by other stressors such declines in fish stocks, technological improvements, new fishing regulations, and market fluctuations. The methodology used for the community-level vulnerability assessment must thus take these factors into consideration.

While the project necessitated the development of a "rapid" methodology that could be used by a team of researchers over a few days, it must be highlighted that efforts were made to maximize authentic participation that could lead to more meaningful outcomes. Glavovic and Boonzaier (2007) outline six essential elements of an authentic participatory approach that, if adopted, could contribute towards enhancing sustainability and coastal community adaptive capacity. Consequently, the research team attempted to frame the RVA as a collaborative research process that integrates community-level knowledge, understanding and values in a process of social learning. Values that underpinned the process were:

- political legitimacy;
- people-centred and process-driven;
- an empowering process;
- relationship focused;
- extend and deepen public participation;
- innovation, reflection and deliberation

## 4.2 Stakeholder planning workshops and case study selection

Essential concepts from the literature review, as well as a draft RVA methodology developed by the University of Cape Town (UCT) project team, were subsequently presented at a stakeholder workshop held in Cape Town, South Africa, with attendance from non-governmental organizations (NGOs), government officials and research institutes from the three countries. This workshop was important in order to: (i) inform key partners and other relevant stakeholders of the project; (ii) present the draft RVA methodology and consider any refinements that may be specific to the particular country context; (iii) discuss and plan the logistics for conducting the RVAs in each country; and (iv) ensure that all relevant information on the particular cases was obtained. An in-country workshop was subsequently held in both

Namibia and Angola in order to allow more participants to attend and further fine-tune the fieldwork process.

Presenting the draft RVA at the stakeholder workshops prior to application in the field was essential as both government and NGO stakeholders were able to provide key insights into the practicalities of the RVA. Certain modifications to the draft RVA were also proposed:

- The draft RVA consisted of a three-day workshop process, but workshop participants considered this would be too long. Stakeholders were of the opinion that fishers would only be prepared to attend a two-day workshop.
- Participants stressed that careful attention would need to be given to the timing of the workshops, preferably holding them during non-fishing periods.
- NGO stakeholders suggested the involvement of fisher leaders in each case study community prior to the workshop so as to ensure broader support for the workshops. In South Africa, for example, it was decided to work closely with the national fishers' network Coastal Links. In Namibia, the local expert connected with various fisher organizations, and in Angola, the government Institute for Artisanal Fisheries (IPA) facilitated involvement of the organized cooperative structures and their leaders in the case studies selected.
- A clear mandate from the stakeholder workshops was to set up the RVA in a way that would maximize participation of local communities in the process of developing sustainable adaption options and strategies.

Last, it was regarded important by all to be clear with workshop participants how the RVA would become the basis for longer-term engagements with the communities on issues of climate change adaptation, especially by the fisheries authorities within the BCLME.

With regard to the case studies, various criteria were suggested for their selection:

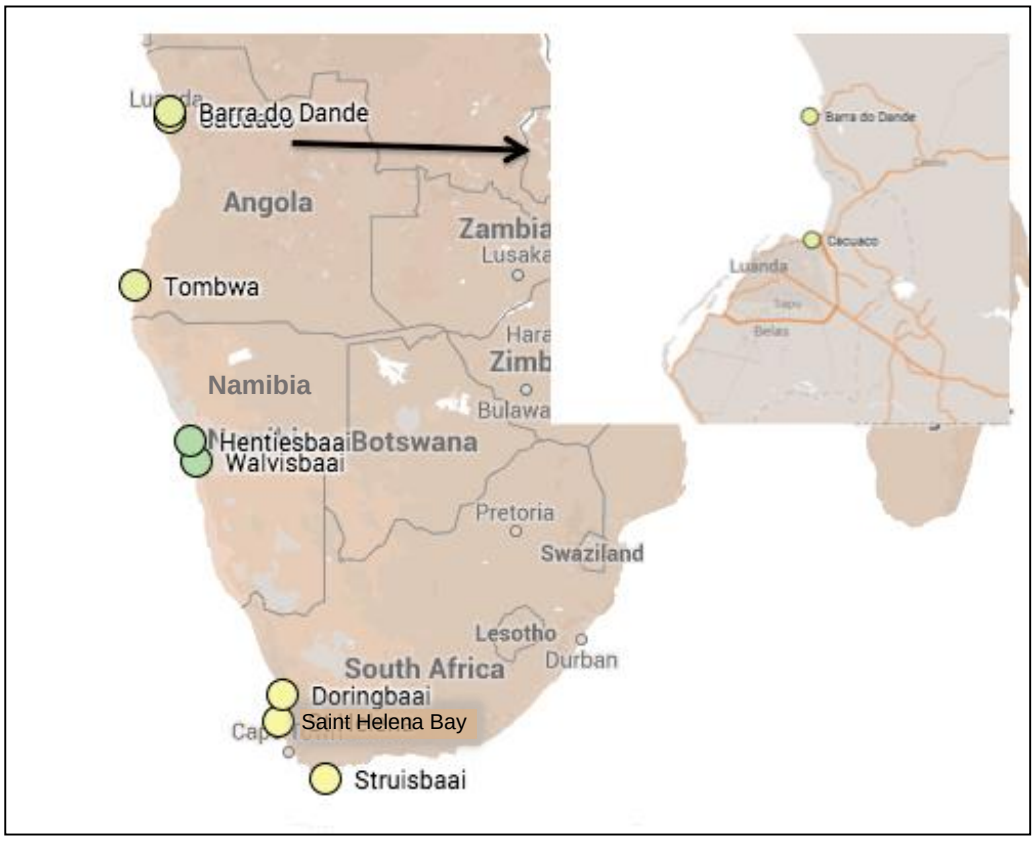
- A diversity of fisheries, from shore-based, boat-based pelagic or benthic fisheries, using a wide variety of gear types.
- A spread of interesting characteristics linked to individuals and/or collective action potential that could hinder or enhance adaptive capacity, e.g. organization into cooperatives or cooperation with private partners and NGOs;
- Existing scientific and key-expert information that indicates the area is affected by climate change (if available).
- Maximize potential overlap with a concurrent project being implemented in South Africa and several other non-BCLME countries e.g. Global learning for local solutions: Reducing vulnerability of marine-dependent coastal communities (GULLS), and a planned GEF programme linked to climate change adaptation in the BCLME of which this RVA project is considered to be a precursor. Several workshops have been held in the planning phase of this programme during which potential case study fisheries and communities have been identified.

Finally, constraints within the project budget, time frames and organizational capacity of all the partners/partner organizations need to inform the selection of case studies.

It was decided at the stakeholder workshop to undertake a pilot RVA in Doringbaai, a coastal community in South Africa (Figure 4) and to refine the methodology based on its suitability in the field. The three country teams would then apply the refined RVA methodology to assess socio-ecological vulnerability in their case study sites. It was agreed that there would be three case studies in both South Africa and Angola, and two in Namibia. The case study sites finally selected were: Doringbaai, Saint Helena Bay and Struisbaai in South Africa; Tombwa, Cacuaco and Barra do Dande in Angola; and Walvis Bay and Henties Bay in Namibia (Figure 4).

**Figure 4**

**Location of case study sites for the RVA**




### 4.3 The rapid vulnerability assessment

The focus of the RVA is to assess socio-ecological vulnerability of coastal communities, taking account of their experiences and perceptions of environmental variability and climate change. A key aspect of the RVA is to investigate what coping mechanisms and adaptation strategies communities have employed, whether these strategies are effective and considered suitable for application in the future in light of current trends and anticipated changes, and if not what other adaptation strategies need to be considered.

In each community, using participatory assessment tools, a profile and map of the socio-ecological system were drawn up, stressors and threats were identified, and vulnerabilities assessed in terms of geographical location, the fishery, post-harvest activities as well as the different groups affected such as youth, women's groups, and institutions. Key events and changes that affected the fishery system and local livelihoods were then identified and discussed. Coping mechanisms and adaptation strategies to address stressors and changes were then identified and discussed, and key adaptation options were highlighted for follow-up by governments, NGOs and research institutes. This was done during a two-day workshop consisting of several dedicated plenary discussions and group exercises. In most cases, the

workshop was followed by key informant interviews or focus group meetings on the third day (See Figure 5 and Appendix 1).

### *4.3.1 Facilitator, field work team and preparations*

Critical to the successful rollout of the RVA is the formation of a team that can facilitate the process, that can manage community dynamics, and that has prior knowledge of the context, i.e. the fisheries and communities in question. In each case study, the team consisted of at least one lead researcher from the UCT team, a local expert based in the respective country, and a community field worker from the NGO sector or a community-based organization (CBO). In Angola, staff from the IPA attended all workshops, and as did staff from the fisheries authority in Namibia. The main facilitator is required to possess local knowledge of the case study context, have experience in running community workshops, have knowledge of a suite of participatory appraisal tools, and ideally should be able to speak the local language. If the latter was not possible, a local translator was hired to assist with translation.

Prior to each workshop, it was also necessary to initiate contact with the community members, gauge their interest in participating in such a process, and discuss time frames that would not be in conflict with fishing activities or other important governmental workshops. In South Africa, a pamphlet was distributed two weeks prior to the actual RVA workshops, and in Namibia, the local expert held meetings with the community leaders from both case studies prior to the workshop in order to discuss expectations and local arrangements. In Angola, IPA representatives contacted extension officers and cooperative leaders in the communities and requested assistance in identifying participants and setting up the workshops.

### *4.3.2 The RVA workshop*

The RVA runs over two and a half days, with the main workshop taking place over two days and consisting of eight distinct exercises that are either run in plenary by the facilitator or in small groups with feedback to plenary by an elected rapporteur (Figure 5 and Appendix 1 for more detailed description of the RVA process).

**Figure 5**

**The RVA process**


In each case study, 20–30 community members were invited to participate in the two-day workshop. The participants consisted of fishers, fisher leaders, crew members, boat owners, fish processes, women and older members from the community. It was up to the local NGO worker, or in the case of Angola, the cooperative leaders, or in the case of Tombwa, the IPA extension officer, to invite participants from the local community to the workshop. The focus was on obtaining a diverse group of participants in order to gain various perspectives (Box 4) and assess differences between groups. If, after the workshops, certain issues needed further clarification, the option was presented to hold smaller focus group meetings or conduct interviews with key informants identified by workshop participants.

The RVA process was explained at the start of each workshop, together with the objectives of the project and workshop (Appendix 1). An opportunity was provided to discuss expectations of participants and what follow-up activities could be expected. Each team member was introduced and all participants were invited to introduce themselves.

The following sections describe the way the exercises of an RVA is typically conducted, with some examples from the actuals workshops.

*Box 4*

*Objectives of the RVA workshop*

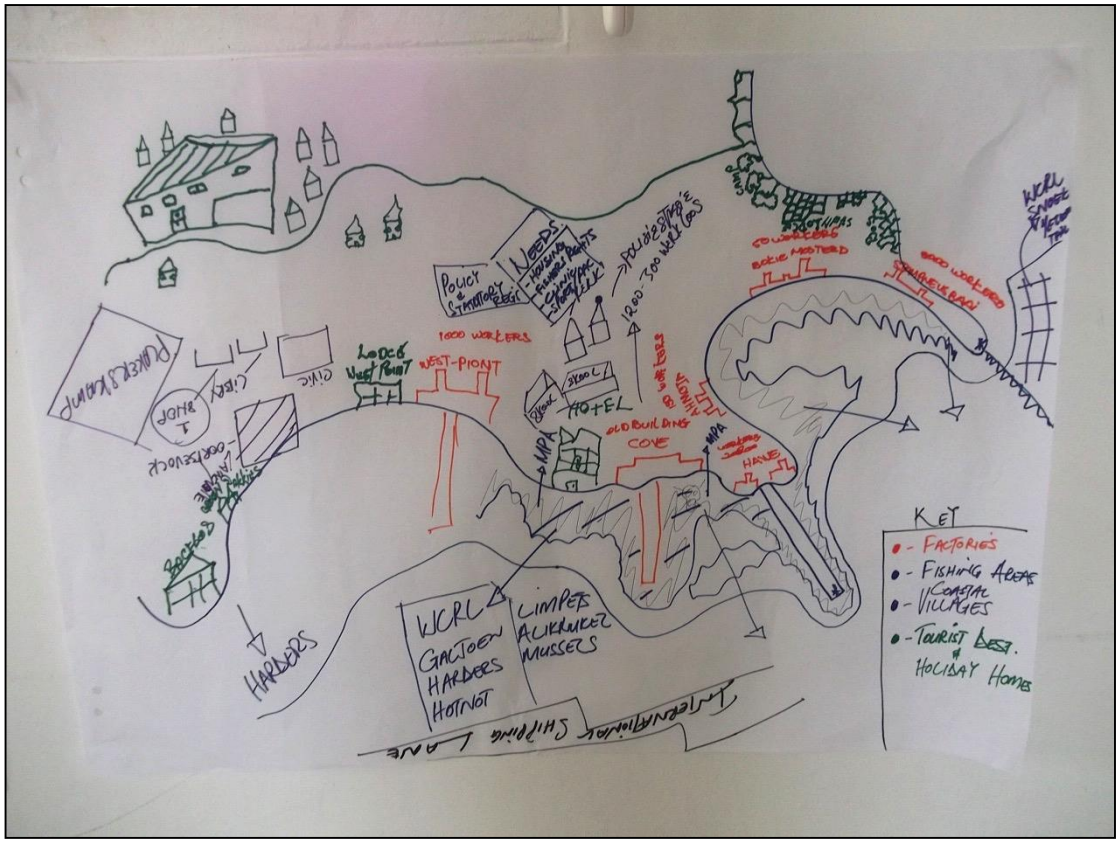
Objectives for this workshop: To hear your voices, to learn about your lives and livelihoods as fishing communities, and the threats/stressors that you experience, especially the environmental and climate-related changes you experience, the impacts of these environmental changes/stressors on your livelihoods, the strategies you use to cope with and adapt to change and difficulties, and what support is required to better cope with and adapt to changes/stressors.

### *Village mapping*

Exercise 1 consists of a typical village mapping. Participants are divided into two or three small groups and asked to draw a basic map of their community, its main assets, livelihood and income generating activities as well as relevant institutions that govern people's livelihoods. An example of a village map generated during this study is provided in Figure 6. The facilitator allocates a number between one and three to each participant to ensure a good mix of participants and to minimize the dominance of any vocal or powerful individuals. Each small group is then asked to report back to the plenary. This process allows other participants to validate or interrogate the map, and gives the facilitator and his/her team a quick overview of the socio-ecological system and its main characteristics.

**Figure 6**

**Example of village map developed during the RVA at Saint Helena Bay**




### *Identification and ranking of key threats/stressors*

Exercise 2 is a plenary exercise with each individual being given five cards and asked to identify threats or stressors linked to their livelihood. Participants are required to identify threats or stressors related to: (i) the environment; (ii) their socio-economic circumstances; and (iii) the management/governance arrangements relevant to their livelihoods. Each individual is then asked to formulate the stressor/threat in a few words on a card and then post the cards on flipchart paper under the relevant category: environment, socio-economic and management/governance (Figure 7).

**Figure 7**

**Identification of key threats and stressors**


The following exercise (Exercise 3) is concerned with ranking the stressors/threats. However, before this can be done, similar issues raised need to be clustered into themes, or main issues, under each category. This activity is done by the facilitation team during the break (Appendix 1). These themes/main issues are then discussed in plenary to ensure participants agree with the way issues have been grouped. Participants are encouraged to reflect on the themes/issues and identify any additional issues that may have been omitted. Participants are then asked to identify the most important stressors or threats that they are facing as individuals or communities. Participants are given six stickers to paste onto their priority issues. Women and men are given different coloured stickers in order to differentiate the groups. Participants can distribute the stickers across their priority issues as they choose. Figure 8 provides an example of the ranking process. This is a quick exercise that allows for the prioritization of issues for further discussion.

**Figure 8**

**Example of ranking exercise to identify the key stressors and threats**

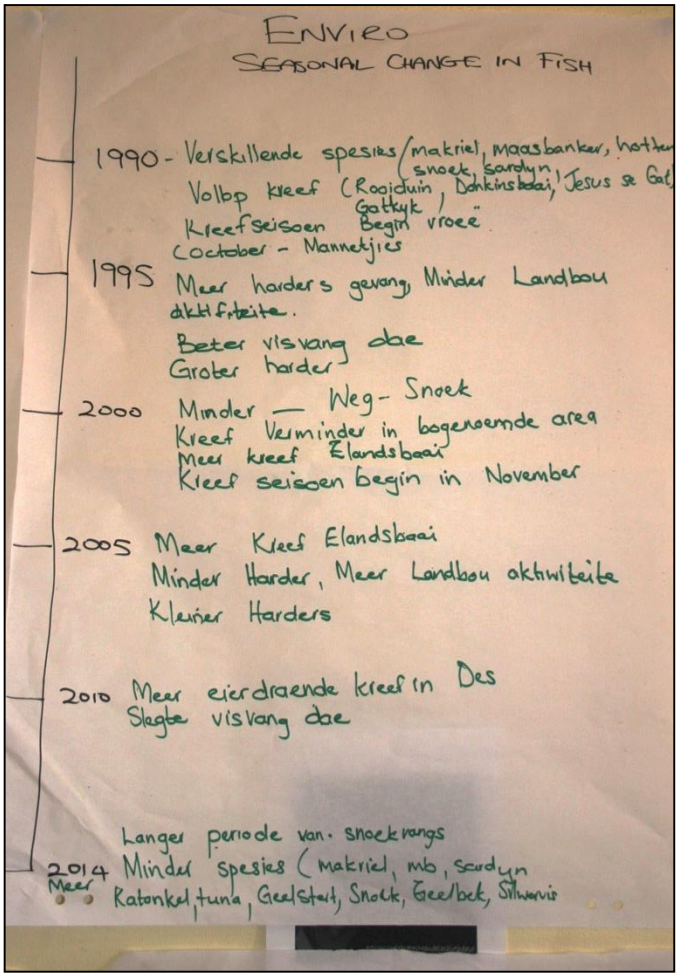

*Note:* Women ranked their issues using green dots and men used red ones

***Identification of key events and changes linked to top stressors***

The six highest-ranked issues (two from each category) are then further unpacked in Exercise 4. However, depending on the outcome of the ranking, the facilitator may choose another issue that is broader in scale than the one identified in the ranking but that could allow for more in depth discussion and knowledge gathering. For example, fishers may have ranked "bad prices" very high, but the facilitator could choose "market problems" as a broader topic while probing for specific information regarding prices. However, it is important to highlight the original topic and its linkage with the broader issue chosen. The participants are then divided into three groups, each tasked with identifying key changes or events (including environmental, socio-ecological and political or governance events/changes) related to the selected stressor/threat that has or may have affected livelihoods. Participants are asked to recall events and changes that they have experienced or they perceive to have occurred from the 1980s to the present time. Figure 9 shows an example of a timeline related to seasonal changes noted by one group of fishers from Doringbaai.

**Figure 9**

**Timeline of key changes and events related to fishing seasons (Doringbaai, South Africa)**

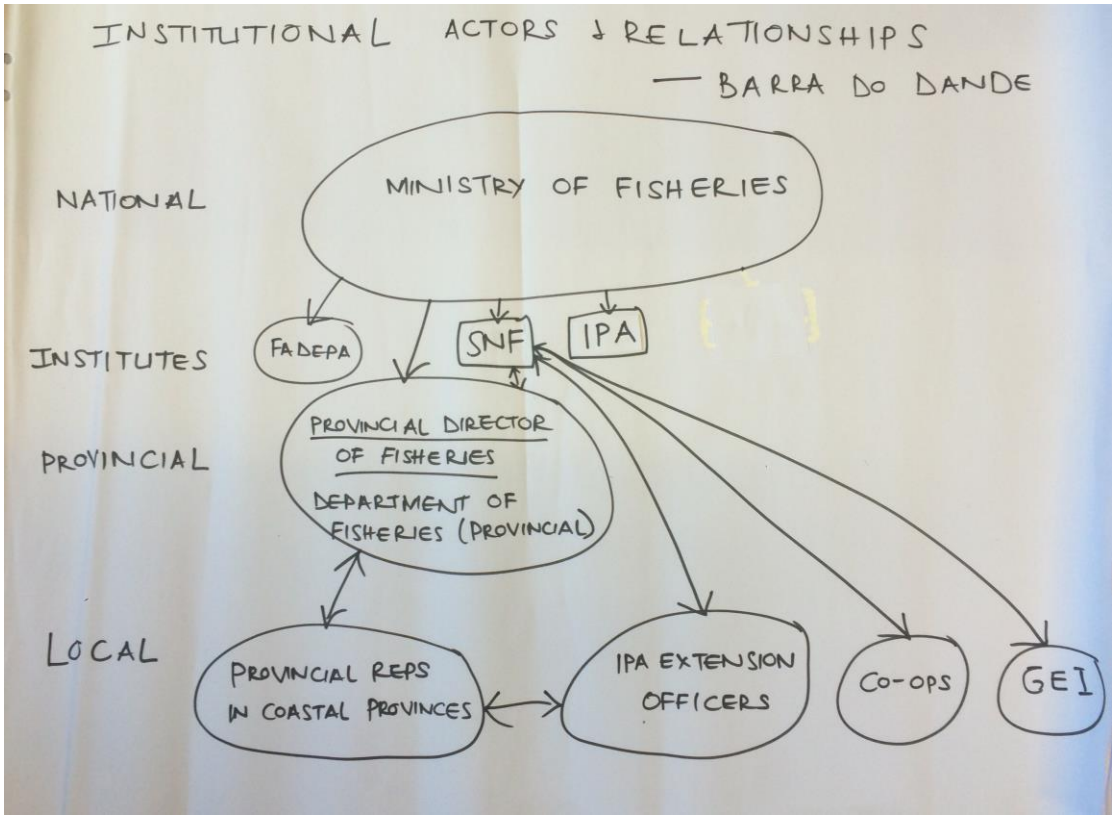



***Map institutional dimensions and relationships***

The purpose of Exercise 5 is to identify main governance actors and institutions relevant to livelihoods and the fisheries sector in particular and map the relationships among these actors and institutions, from the perspective of the fishers. Venn diagrams of different sizes can be used to illustrate the importance of different governance actors/institutions (Appendix 1). Time constraints resulted in this exercise not being completed in several sites, although discussion on governance arrangements and institutional changes and how these affected local livelihoods were raised in discussions on stressors and frequently emerged in the construction of timelines. Figure 10 provides an example of the institutional map generated by participants at the Barra do Dande workshop in Angola.

**Figure 10**

**Institutional actors and relationships – Barra do Dande, Angola**




Exercises 1–5 five are conducted during the first day and necessitate about 5–6 hours of discussion, not including breaks. At the end of day one, the facilitator summarizes the main activities and outputs that have emerged and explains the process that will be followed the next day.

***Identification of impacts associated with environmental variability and climate change***

The focus of day two is on environmental variability and climate change as experienced or perceived by the participants. The first exercise (Exercise 6) aims to explore the environment-related events or changes identified on day one, and their direct and indirect impacts, and consider how these have contributed to local vulnerabilities. The participants are encouraged to further explore the possible causes of these events and changes. This is a facilitated exercise conducted in plenary and allows the gathering of more in-depth information on the participants' perceptions or experiences of environmental change and how these changes affect their lives and livelihoods (Appendix 1, Table A1.2). These discussions also generate insights as to how various direct and indirect impacts on livelihoods are linked and how a particular change can generate multiple impacts that may affect individuals, households or the community at large. Table 1 provides an example of an impacts table generated at the workshop in Saint Helena Bay.

**Table 1**

**Stressors, impacts and possible causes as identified in Saint Helena Bay**

| Stressor | Impacts | High/ medium/ low | What do you think caused these environmental changes? |
|---|---|---|---|
| Seasons changing | Uncertainty – cannot plan. Lower fish quality with season change (snoek). | H | Pollution – factory waste. Shipping lane, tankers in way, keep snoek out. Tankers destroy environment /sea bed and banks. Sea conditions better farther out – could be because temperature / changing sea conditions. Excessive pressure by trap fishers (commercials) in area (40–60 traps per boat). |
| Catches reduced | Less money. Less work opportunities. Breakdown of social fabric (drugs, alcohol etc.). More petrol needed – go out to sea more but catch less. | H | Pollution – factory waste. Trawlers catch the food of the snoek (pelagics) trawlers come in closer – allowed to catch sardine and anchovy in closed lobster area. |
| Resources farther out | Quality of fish decreased. More petrol = higher costs and expenses. Fishers die at sea (safety). Need to improve technology and gear, also for safety at sea (GPS) | H | Industry boats fishing inshore area. Fishing industry contributing to global warming (short-term vision – they focus on profit) – and broader environmental impacts. Maybe changing seasons and shifts of resources as result of global warming. |

***Identification of current coping mechanisms, adaptation strategies and support required***

The second exercise on day two (Exercise 7) aims to identify and assess the nature and effectiveness of current coping mechanisms and adaptation strategies to the main environmental changes and/or events identified. Participants are asked what responses or strategies are working, who initiated these and whether the broader community has adopted these new strategies (Appendix 1, Table A1.4). This exercise can be conducted in smaller groups with plenary feedback or by the facilitator, in plenary, depending on literacy levels of the fishers. In most workshops, this exercise was conducted in plenary.

The final exercise (Exercise 8) takes the adaptation strategies that were identified as working or promising and seeks to identify the needs or support required in order to develop longer-term adaptation strategies. Participants are asked what support is needed, and who they believe could provide the support. They are also asked to discuss what they can do at the local level to develop local capacity to better respond to changes and challenges, and how government could support them (Appendix 1, Table A1.5). Time is allocated to discuss a range of options related to fishing practices, collective action, research and knowledge generation, regulations, and broader developmental and governance needs. Emphasis is also placed on identifying new or additional partnerships with local, provincial and national agencies mandated to support fisher communities. In practice, the final two exercises merge into one as the information provided

on coping mechanisms and adaptation strategies forms the basis for discussing what strategies are working or should be implemented, and what support is required. Additional sheets of flipchart paper are added to create a further column and the matrix is completed. An extract from the table on adaptation strategy and needs generated by participants at Barra do Dande is provided in Table 2.

**Table 2**

**Extract from table: adaptation strategies and needs for Barra do Dande**

| Environmental problem | What adaptation strategies are working /could work? | What support do you need? | Support from whom? |
|---|---|---|---|
| Less fish | Decrease number of industrial vessels (programme proposed but never implemented) | – Impose limits on number of industrial vessels<br>– Better enforcement | – Government (Fisheries Ministry and IPA)<br>– Enforcement officials |
| | Fishers and fishworkers must be involved in cooperatives | Assistance with local organization | – Government – IPA and new training centres<br>– cooperative leaders and members |
| Rougher seas | Access to Internet for weather forecast for fishers. Those with access to Internet can inform the rest of the community. | – Need early warning (EW) system.<br>– Need radios for ship-to-shore communication<br>– Need local centre for fishers with computer, access to Internet | – Government to work with fishers to develop EW system<br>– Government to provide support to set up local fishers centre |

***Next steps***

In the final session of the workshop, joint plans are made on how best to take forward the information generated at the workshop, what feedback mechanisms on the overall outcomes of the study would be most appropriate, what immediate follow-up steps are required and what longer-term actions are needed. The participants are also asked to evaluate the two-day workshop and highlight both positive and negative elements of the RVA process.

Day three is reserved for more in-depth interviews with key informants who were not at the workshop and were identified by the fishing community as knowledgeable persons, or with a group of fishers who are willing to unpack key issues further.

# 5. FINDINGS

## 5.1 South Africa

Three case studies were selected in South Africa: Doringbaai, which also acted as a pilot for the RVA methodology, Saint Helena Bay and Struisbaai (Figure 11).

**Figure 11**

**South African case studies**


### *5.1.1 Doringbaai*

***Overview and livelihood activities***

Doringbaai is a traditional fishing community of about 1 200 inhabitants located on the west coast of South Africa. It is a small rural fishing village, with the majority of the impoverished community relying on marine resources. Doringbaai falls within Matzikamma Municipality, which is characterized as a dry area, hence most people turn to the sea (Sowman *et al*., 2008). The tradition of fishing has been well established through at least three generations, with a heavy reliance particularly on WCRL and line-fish resources.

With regard to fishing rights, in the northern and western Cape an unknown number of small-scale fishers[3] have obtained formal access through a commercial rights allocation in 2005, namely long-term (ten years) rights to the line-fish, abalone and nearshore WCRL resources. In addition, 1 500 small-scale fishers in the western and northern Cape have received annual

[3] Individual commercial rights were allocated to almost 850 people. However, it is unknown how many of these fit the criteria of a "small-scale fisher" as per the new small-scale fisheries policy (DAFF, 2012).

"interim relief permits" (IRPs) since 2007 to undertake fishing for certain line-fish species, WCRL and white mussel. The IRPs are issued to individuals identified by the fishing community, and a small quota is allocated to individuals or the community that are allowed to catch it. It is envisaged that IRPs will be issued annually until the new small-scale fisheries policy is implemented. Recently, the Department of Trade and Industry (DTI) has instituted a programme for the development of cooperatives, whereby, once formed, fishers can receive small ski-boats at heavily subsidized rates (Sowman *et al*, 2011b).

More than 30 community members attended the workshop, i.e. rights and permit holders, boat owners, crew members as well as 14 women, some of whom possess IRP permits or are active in the post-harvest sector. An invitation had only been circulated in Doringbaai; however, several fishers from Ebenhaezer and Lambertsbaai, neighbouring communities, also attended as they wanted to understand the workshop process and gauge how this project could benefit their respective communities. This presented some methodological challenges. However, care was taken to distinguish responses from the Doringbaai community from those of the others, and certain exercises were run separately for the two other communities. As this case study was also the pilot for the RVA, it was felt that having community members present form nearby areas could be beneficial as a way to compare findings, especially the observations and perceptions of environmental change. Ages ranged between 21 and 82 years with an average of 40 years.

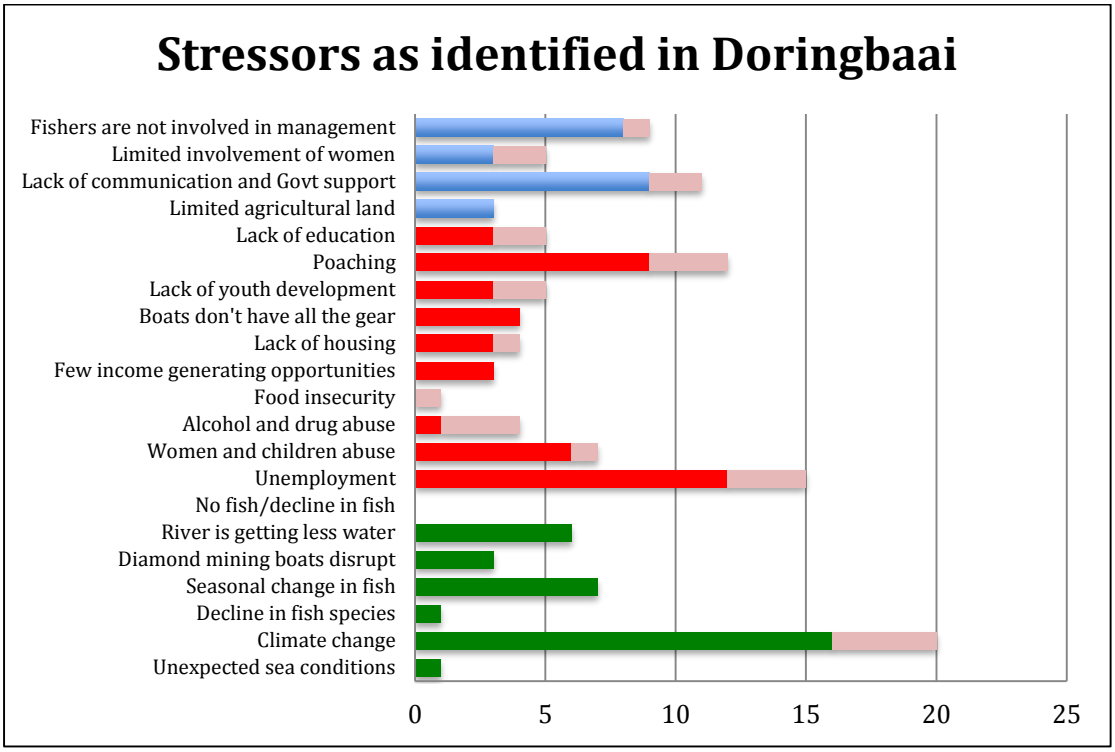
In Doringbaai, small-scale fishers possess line-fish or WCRL rights (10) or IRP permits (70–100) or still operate informally, waiting for small-scale fishing rights. Some fishers use recreational permits for shore angling. The fishers estimated that about 200 households are fisher families. The village map also indicated that community members were employed in the various shops, tourist accommodation and pubs. A larger number of people had found jobs in the harbour, in the new winery and restaurant, the abalone farm and other smaller job development opportunities supported by the local municipality. The closure of the Oceana WCRL processing factory in 2006 has had significant impact on the community, as the factory had been the main employer in the area and thus a significant source of income for many fishing households in the community. Since the closure, the municipality, in partnership with the various community organizations and some private sector investors, has initiated a series of projects using the old factory grounds. Several villagers also mentioned that they had found employment in agricultural projects associated with the school and inland.

***Stressors and vulnerabilities***

Participants identified and then ranked key stressors under the categories: ecological, socio-economic and management/governance (Figure 12).

**Figure 12**

**Stressors and their relative significance in Doringbaai**




*Notes:* Women = pink; ecological = green; socio-economic = red; governance = blue.

The workshop participants ranked climate change very high (perceived impacts discussed below), and associated high risks in this stressor with the lack of safe boats, training and safety equipment. Within the ecological category, unexpected sea conditions, a seasonal change in fish availability and a decline in available fish species were identified by the participants as other important stressors. Doringbaai is located near the mouth of the Olifants River. The Doringbaai small-scale fishers also target species that spend periods of their life history in the estuary; hence, several fishers raised the fact that the river had less water than in previous years owing to the upstream dam affecting catches. Fishers also believed that diamond mining from boats in the vicinity of fishing grounds had disrupted fishing patterns. None of the workshop participants gave a ranking to the "no fish/decline in fish" stressor.

Within the socio-economic category, unemployment was ranked high, and this was seen as having increased substance abuse as well as abuse of women and children. The lack of job and development opportunities in the area, the limited land available for agricultural use, and the lack of adequate schooling and youth development strategies have forced many younger community members into illegal fishing, mainly for lobster, which they sell onto the informal market. Some older fishers are also involved, as they have lost trust in governments' promises of fisheries transformation and are not given a chance to participate in the management of the resource.

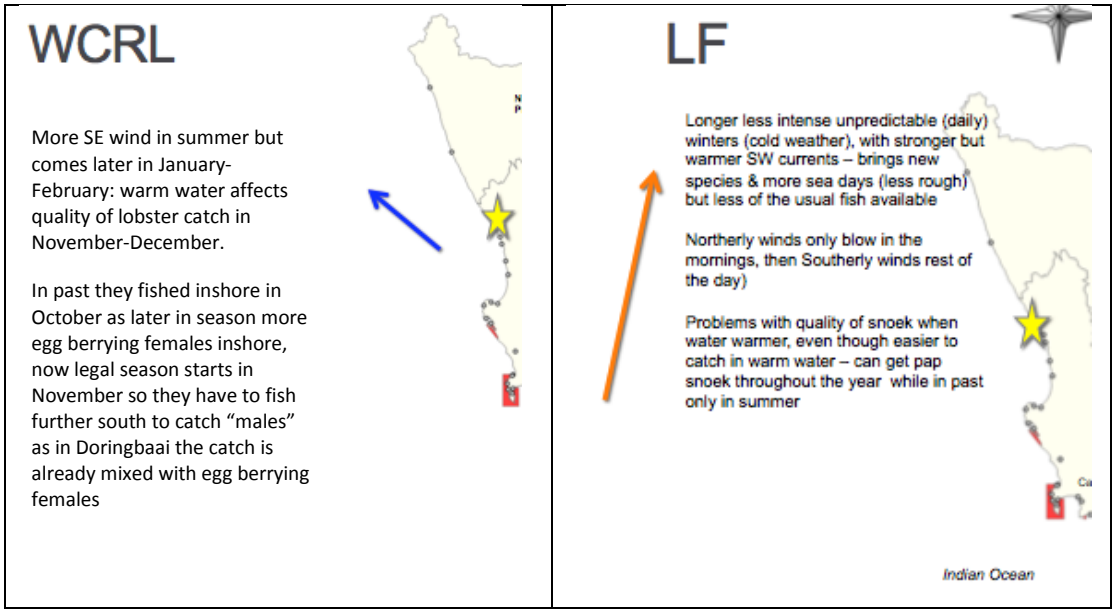
The female participants in particular raised important social challenges such as substance abuse, abuse of children and women, and the lack of opportunities for the youth. They felt that they were not sufficiently involved in the fishery sector.

***Historical review of key events and changes***

Fishers identified several changes in the weather patterns that had affected their fishing practices, both for the line-fish species and the WCRL. Figure 13 summarizes these observed changes.

**Figure 13**

**Summary of perceived climatic changes by the Doringbaai small-scale fishers**




The fishers reported that the dominant summer wind, the southeaster now only increases in frequency and strength much later in the season. The southeaster causes upwelling and decreasing inshore water temperatures. The late arrival of the cooler upwelled waters (i.e. warmer waters still present when the lobster season opens) causes the lobster to easily perish (die more quickly) or be of lower quality, which in turn fetches lower prices on the market. In addition, fishers used to start fishing for WCRL in early October because later in the season they would catch females in berry, which is illegal. Nowadays, the legal season opens in November forcing the Doringbaai fishers to fish farther south where they report that fewer females are in berry during the same month. They claim new regulations as well as distributional changes are driving this change in fishing practice. However, they were not able to clarify whether the spawning season in Doringbaai had changed, possibly linked to the changes in wind patterns, or whether this observation was mainly linked to the changing regulations.

Fishers identified pronounced weather changes that were affecting line-fish catches and the frequency of sea-going days. Fishers believe that, compared with 20 years ago, winters are longer, less intense and less predictable on a daily basis. Winters are now dominated by the southwest currents, which are believed to be warmer. Combined, these changes bring the possibility of more sea-going days; however, with more unpredictability while at sea. Fishers have to go out to sea for longer, increasing their risk of accidents out at sea. The warmer currents also bring new species. This is regarded as an opportunity and potential new income; however, knowledge on how to catch these species is still building. Overall, fishers argue that specific months and seasons were associated with the catch of specific species in the past, while in the last 10–20 years these delineated periods have become less distinct.

Doringbaai has also seen drastic social and governance changes. Many women argued that in the past strict laws and enforcement, more job opportunities and good leadership prevented alcohol and drug abuse as well as the abuse of women and children. Many of the community values and mutual respect have now been replaced by materialism and criminality. At the same time, the closing of the Oceana factory and use of more-efficient trap boats to catch the commercial catch (fewer crew needed), a higher dependence on government grants, and a deteriorating education system have increased poverty and the general feeling of

marginalization. Government has initiated job development programmes, and has more recently recognized small-scale fishers. However, fishers are still waiting for the replacement of IRPs and inshore commercial rights to small-scale fishing rights, and the much-needed training and support to operate and maintain the boats donated by the DTI. Poaching has increased drastically as well. A lack of trust and legitimacy for government management approaches was prevalent as fishers felt that despite promises they had no say in the decision-making processes surrounding their fishery.

***Impacts associated with environmental stressors and changes***

Climate change is believed to be the root cause for the perceived seasonal changes, changes in wind speed and direction, unpredictable daily weather and seasonal catches, changing water temperature (warmer water in winter, cold summer water later in season), the occurrence of different species in winter, and apparent changing distribution patterns of lobster along the coast. Fewer or unpredictable fishing days, lower catch per day, longer fishing trips all mean less income and an increased cost of fishing. The occurrence of "south coast" species (e.g. yellowtail, geelbek) is seen as an opportunity as these species can fetch higher prices; however, demand in Doringbaai from local and regional intermediaries has not yet increased. Fishers also complain about needing the right gear and expertise to catch these "south coast" migratory species. However, a longer season for migratory snoek has meant more fish available to the local population, but also lower prices on the regional markets due to oversupply.

With respect to WCRL, fishers had at first attributed the changes in availability during the fishing season and abundance along the coast to climate change only. However, discussions among the fishers provided new insights that some of the changes observed could be caused by: (i) the new regulations; (ii) the commercial fishing season, which legally starts before the small-scale fishing season; and (iii) diamond mining, which could affect lobster aggregations slightly offshore. Multiple factors could cause these changes, and fishers realized that their observations were more likely to have been caused by fisheries-induced changes (regulations and effort). Overall, however, lobster catches in the small-scale fishery were still regarded as good with the potential for increase, especially as fishers have only recently obtained IRPs, and boats.

***Coping mechanisms***

Participants identified a host of coping mechanisms that had been initiated by the community or facilitated by government. The most significant and recent change was the fact that Doringbaai small-scale fishers have become organized into several smaller cooperatives and an umbrella cooperative. While the DTI had provided the incentive for fishers to become organized, the fishers themselves had designed this hierarchical structure in order to mitigate conflicts while maximizing collective benefits (bargaining power with buyers, advocacy with local government, etc.). Through this collective action process, they were able to obtain boats from the DTI, better support from the municipality, and achieve better deals with seafood buyers and an improved relationship with the fisheries authority. While all participants agreed that this initiative had improved livelihoods in the fisher community, there were still some problems with regard to internal communication and accounting. Skills training and capacity development by various government agencies were seen as high priorities.

Specifically related to the WCRL fishery, members of the cooperative have become better organized by pooling their resources (boats, fuel, trailers, cars, etc.) in order to travel down the coast to harvest their IRP lobster farther south. They successfully lobbied the fisheries authority to allow them to fish farther south, and have managed to save costs by working as a collective. In addition, they have also been able to source cheaper bait and buy in bulk (hake and sardines), and some fishers have experimented with other locally available species such as white and black mussel and gurnard.

With unpredictable weather and the need to fish for more days in order to obtain a viable catch, fishers' safety at sea has become a greater concern. Some fishers have obtained GPS devices,

and through the DTI programme they have received better boats and safety equipment. Weather predictions are consulted on mobile phones. By working and fishing as a group, they have developed a better system of staying in touch and knowing of one another's whereabouts.

Despite the allocation of IRPs, collective action and increased government support, many fishers are still forced to find seasonal jobs as crewmembers on commercial vessels. This provides income although men are away from home for long periods. A few households have also found additional jobs on the adjacent farms.

Catches obtained in unusually warmer water are an increasing problem. For lobster, fishers have started using special bags that they keep wet and use to cover the crates, especially on hot sunny days. Some fishers have purchased cooling tanks and pumps for use on their vessels; and on land, the cooperative has invested in holding tanks as well. The snoek caught during warmer weather spoils easily. However, some women in the community have started making larger quantities of fish cakes.

***Adaptation strategies and needs***

Throughout the workshop, participants identified a number of strategies that they believed could improve their vulnerable situation. The strategies listed were aimed at increasing the overall resilience of the fisher community to a myriad of social and ecological changes (see summary in Table 3). However, most suggestions were not directly linked to the environmental stressors and changes observed. Building on their recent organizational development, fishers need training and support programmes in order to run the cooperative accounting, better market their catch and improve on the collaboration between community workers. Fishers highlighted the formation of the umbrella cooperative as a key strategy that has benefited them thus far and should be strengthened. In the light of more unpredictable weather, fishers urgently need to be equipped with the appropriate safety gear and communication tools. One fisher suggested the development of a national sea rescue base in Doringbaai servicing several fishing communities. Fishers also want to improve their fishing technology towards minimizing post-harvest losses, both out at sea and at the landing site. From a fisheries governance perspective, fishers want to be able to fish in adjacent areas, by having agreements with neighbouring communities. They argued that an inshore zone, exclusively for small-scale fisher use, would resolve many conflicts with commercial and recreational fisher groups, and also sustain viable catches. Last, many community members expressed the need to develop complementary livelihoods in the aquaculture, farming and tourism sectors.

**Table 3**

**Adaptation strategies and needs for Doringbaai**

| ***What strategies are working / could work?*** | ***What support do you need?*** | ***Support from whom?*** |
|---|---|---|
| Local-level organizations (fisher cooperatives, associations) | Improve financial skills, improve networking, improve respect, work ethics, responsibilities, improve collaboration between cooperatives, – better governance | NGOs – not once off – for skills training, fully accredited institutions, DAFF, DTI, all stakeholders involved in small-scale fisheries policy |
| Improving technologies (GPS, cooling lobster with pumps, engines) | Training to use equipment, management of equipment, management plan developed, sea rescue unit for area | SAMSA, SAFMARINE (all accredited), local business, banks, mines, tertiary institutions |
| Able to follow the fish (by land or alongshore) | Better monitoring and management; larger/safer boats(line fish), more research and info and feedback from government for local fishers | DAFF and local = co-management; DTI and cooperatives (through savings), DAFF |
| Exploring new fishing ground | Larger/safer boats, better technology, more research with local fishers | DTI, private-sector support, DAFF |
| Supplementary livelihoods (e.g. farming) | Explore and develop fish farming (guidelines for abalone, mussels, kelp, research, tourism), access to mining, better markets, whale watching | DAFF and fishers themselves, department of tourism, local government, tertiary institutions, DEA, department of minerals |
| Working closely with NGOs (e.g. MDT and CL) churches and other organizations/institutions (UCT) | Counselling/mentoring (to build relationships), communication, community profiles and needs analysed, resources – diamonds, training | The NGOs, churches, UCT, tertiary institutions – MDT, CL and others (NGOs) |

### *5.1.2 Struisbaai*

***Overview and livelihood activities***

Struisbaai is a well-known traditional fishing town located along the Cape south coast. The town has also become a popular coastal holiday destination and retirement location aside from being a historical fishing community. Struisbaai forms part of the Cape Agulhas local municipality, and the Overberg district municipality within the Western Cape region. According to the municipal Integrated Development Plan data for 2010–11, Struisbaai has a population of more than 6 000 people and 1 388 households. However, the Struisbaai small-scale fishers mainly reside in what is known as Struisbaai Noord. According to census data (1996), the population of Struisbaai Noord is slightly more than 1 100 people, while Parker

(2013) estimated its fisher population at about 300 people and 150 households. Residents of Struisbaai Noord live in permanent housing structures. The area is serviced by adequate delivery of electricity and piped water supply. Electricity is the main source of energy for household use, but liquefied petroleum gas is also used by some for cooking purposes (Parker, 2013).

The Struisbaai harbour is the launching and landing site for the local traditional fishers, for commercial line-fishers coming from outside the area, as well as for recreational boat-based fishers. Shore-based recreational fishing also takes place along the Agulhas coast, and several large-scale commercial activities occur offshore (squid and pelagic). Local small-scale fishing activities are largely boat-based line fishing. The local line-fishers operate using about 15 fishing boats that they launch from Struisbaai harbour. About ten of them are "chukkies", the traditional fishing boats with inboard diesel engines, used for generations by the line-fishers of the region. Chukkies are highly restricted in terms of how far they can travel out to sea, so fishers using them are geographically bound.

Other boats are the more modern ski-boats with outboard engines, which can also be towed behind a car from one fishing area to another. The Struisbaai-owned ski-boats are similar to the ones used by the commercial fishers from outside the area, albeit smaller (a maximum of six fishers from Struisbaai Noord own a ski boat, which they obtained with government support). They are able to carry powerful engines that allow them to travel long distances at high speed.

There were 21 participants at the workshop, all small-scale fishers, and all men. Women have played an important role in the Struisbaai small-scale fishery system. However, they were not forthcoming in wanting to attend the workshop as none was working on the fishing boats and they were under the impression that the workshop would focus on fishing practices and observations out at sea. Average age of the participants was 48 years, range 21–72. All participants attended consecutive days of the workshop.

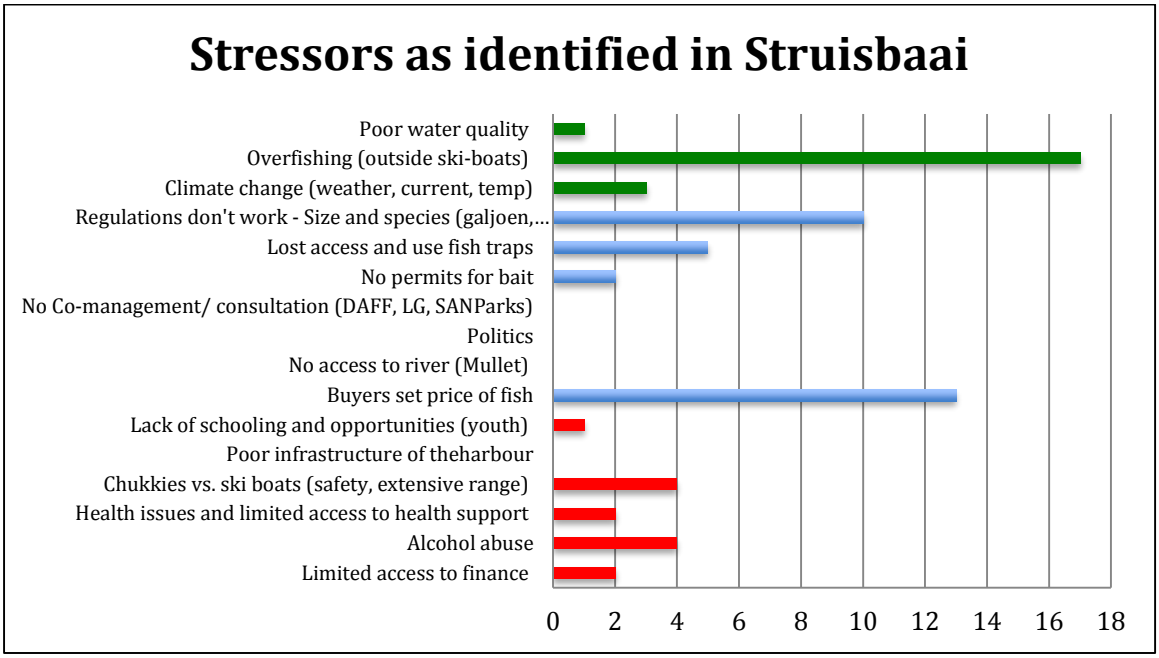
Small-scale fishers from Struisbaai Noord are mainly line-fishers operating from chukkies, and more recently a few ski-boats. Most fishers work as crew given the limited number of locally owned boats. Main species caught are local temperate reef species (steenbras, stumpnose, red roman and silvers) and migratory species such as Cape salmon and yellowtail. Fishers also engage in shore angling for various inshore species as well as beach seine fishing for mullet. During the village mapping exercise, participants highlighted the few alternative income-generating opportunities besides fishing. Some community members have temporary or permanent jobs in the local grocery stores, hardware stores, petrol stations, building sector, tourism infrastructure such as restaurants and accommodation, in the recreational fishing charter businesses, and on the adjacent farms. A key insight from the village mapping exercise is the remoteness of this village in terms of availability of jobs, especially outside the fishing season, and the lack of infrastructure such as schools and hospitals.

***Stressors and vulnerabilities***

Participants identified and then ranked key stressors under the categories: ecological, socio-economic and management/governance (Figure 14).

**Figure 14**

**Stressors and their relative significance in Struisbaai**




*Notes:* Ecological = green; socio-economic = red; governance = blue.

By far the most important challenge in Struisbaai related to the ecological category is the perceived high fishing effort by outside fishers. These include commercial line-fishers and recreational fishers who travel to Struisbaai during the holiday season and each time migratory species are reported to occur in the area. All outside fishers have access to ski-boats, placing them at a competitive advantage to the local chukkie fishers. Ski-boats are able to access the fishing grounds faster than chukkies, and also occupy the best fishing spots. As mentioned above, availability of local vessels is limited and very few fishers from Struisbaai are able to obtain crew jobs on the outside vessels. Moreover, the local ski-boat owners struggle to afford fuel for trips as their market return is marginal. Internally, in the community, some conflict has arisen as a few local small-scale fishers who do not have access to boats migrate to the west coast and work on the commercial line-fish boats. However, they are refused jobs on the local chukkies when they return. They are perceived to be supporting the advantaged ski-boat owners who also fish in Struisbaai when the fishing is good.

Fishers also identified climatic changes, especially changes in wind direction during the main fishing season (summer) as well as increased dominance of particular currents. With regard to the socio-economic category, vulnerabilities that emerged from this exercise were: (i) the lack of access to finance to purchase better boats or engines; (ii) alcohol abuse; (iii) poor health and limited health infrastructure; (iv) lack of schooling and limited opportunities for the youth; (v) overall lack of job opportunities; and, most importantly, (vi) the lack of profitable markets for their catch. Linked to the competition with outside fishers, local small-scale fishers from Struisbaai Noord remain price takers in the value chain. Fishers with chukkies land their catch after the ski-boats, therefore losing out on best prices, and they do not have the capacity to market their catch themselves on more lucrative urban markets. Hence, they are restricted to selling to intermediaries.

Many issues arose in the management/governance category. The poor market was identified as a management issue as local fishers resented the lack of regulation to prevent outside fishers in their area who themselves did benefit from good prices. Separately, fishers did not agree with

the regulations in terms of fish and bait species, fish sizes and available permits. They argued that, with the chukkies, they were only able to catch the smaller sized fish on the closer reefs, compared with ski-boats that go farther out. Over time, women have also lost access to the traditional fish traps, and the area for beach seining has been severely restricted since the "beach driving ban" and protection of the estuary. With regard to the large-scale commercial fisheries, fishers believed that squid jigging at night was disrupting fishing patterns, in turn affecting their fish catches.

Overall, however, fishers complained about the top-down management approach by the fisheries authority and the lack of consultation and transparency with regard to the regulations.

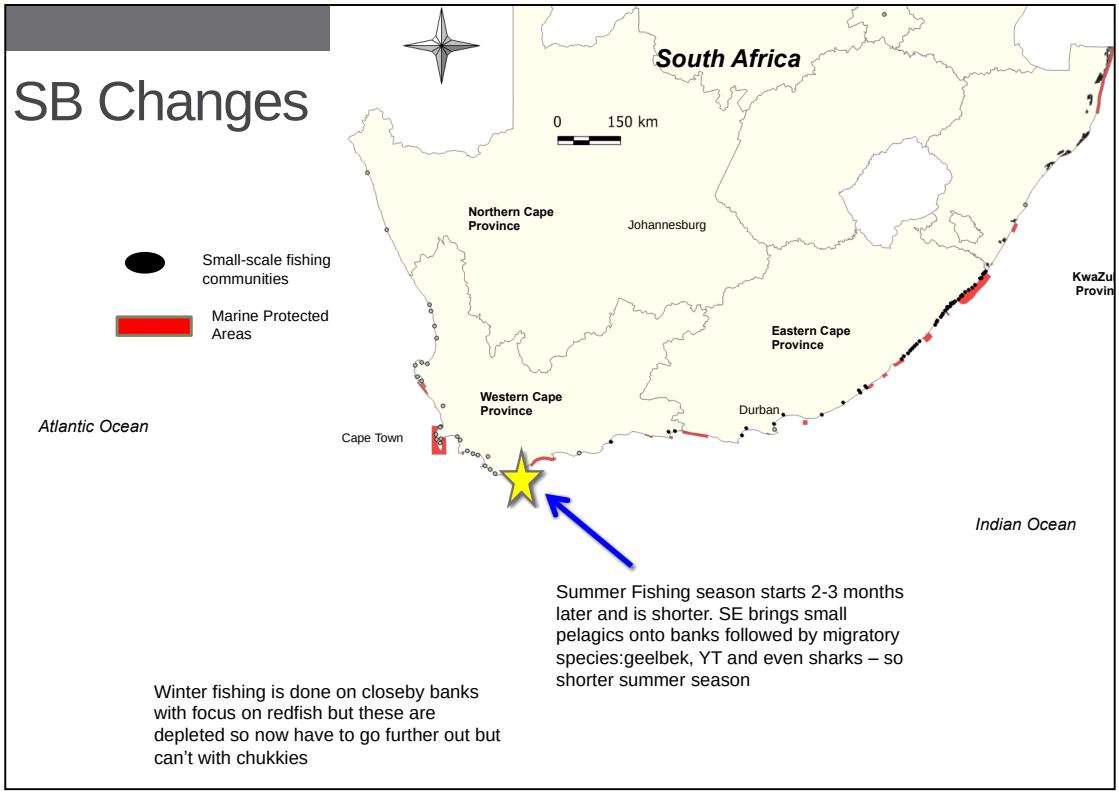
Although women were absent from the workshop, the men highlighted that women in particular were a vulnerable group as they had even fewer livelihood opportunities than men, and their involvement in the fishing sector had been severely curtailed with loss of access to shore-based intertidal harvesting, fish traps and fish processing.

***Historical review of key events and changes***

Fishers identified several changes in the weather patterns that had affected their fishing practices, especially in the light of competing ski-boats and poor market prices. Figure 15 summarizes these perceived changes.

**Figure 15**

**Perceived climatic changes by the Struisbaai small-scale fishers**




*Note:* YT = yellowtail.

Of key concern to the fishers is the shorter summer fishing season, with the dominant southeasterly winds only increasing in duration and frequency much later in the year than before (past: September; now: December–January). The southeasterly is believed to aggregate the predatory fish onto the banks (temperate reefs) as they chase their prey, making it possible for the small-scale fishers to locate them and target them as soon as the wind drops, changes

direction and brings warmer currents with better visibility. In connection with the observed depletion of bank (reef) fish on the inshore banks, and the high cost and danger of even venturing farther offshore, the local small-scale fishers' disadvantage *vis-à-vis* the ski-boat fishers is further exacerbated.

Furthermore, regulations for various species have been drastically increased. For example, the number of species with minimum size limits has increased in comparison with 10–20 years ago, maximum bag limits (i.e. number of same species per day) have decreased, and iconic species such as red steenbras (a main target for small-scale fishers) are now on the prohibited list for commercial and small-scale fishers. In comparison, fishers believe that recreational fishers are allowed to catch two red steenbras per day. Local small-scale fishers argued that these regulations were unfair, not in line with their observations, and most importantly were never discussed with them. They see these regulations as a further marginalization by government, which is influenced by powerful industry players.

In the past, only small-scale fishers had access to the Struisbaai fishing grounds, many more chukkie boat owners were active (up to 30), and there were even people fishing with row boats as fish were abundant on the inshore fishing grounds. There were also no size regulations. However, outside recreational and commercial fishers have now started fishing off Struisbaai. The participants felt that post-apartheid fisheries management had yet to transform the fishing industry and recognize them as legitimate small-scale fishers. They did not understand why the national fisheries authority had prohibited them from upgrading their chukkies to ski-boats, despite support from local government agencies mandated to promote socio-economic development.

***Impacts associated with environmental stressors and changes***

The next exercise consisted of asking the participants what direct and indirect impacts the environmental changes had caused on their lives and livelihoods, and what they thought had caused some of these changes or triggered the specific events.

Fishers' perception was that the increasing number of fishers from outside the area (commercial and recreational) and the associated decline in fish abundance had resulted in declining catches, but also led to conflict at landing sites and on the fishing grounds. At the same time, increased supply of fish to the local buyers had brought prices down for certain species or kept them low for others. Some fishers argued that outsiders had introduced drugs into the community. Reasons given for this influx of outsiders were the fact that Struisbaai had become a popular holiday destination, and also that rights allocations had favoured certain privileged groups.

The increased cost of fish (distance, fuel prices and lower catches) has resulted in less income, issues of food security and increased poverty. Families struggle to pay for school fees and cannot save up for the leaner winter periods.

The chukkie owners cannot keep up the maintenance of their boats, and as a result, struggle to launch their boats when the sea conditions are favourable. Fishers who earn a living as crew seek work elsewhere on ski-boats along the west coast. At the same time, the participants also argued that the increased regulations inhibited them to fish during the best fishing periods.

Unpredictable weather and other changes (shorter season) in the fisheries were attributed to climate change, and this was seen as an effect of increased global population and pollution. A direct impact of this was that chukkies were unable to launch or had to operate in difficult and dangerous sea conditions. Ski-boats are as such safer as they spend less time at sea and can head back to land more easily when the weather changes. Indirect impacts of the weather changes were identified as less income and increased or pervasive poverty. One fisher also mentioned another indirect impact was that many fisher households were suffering from tense dynamics and relationships, as household heads were not able to provide enough food and income.

***Coping mechanisms***

Fishers felt that they had very few ways to cope with the environmental, as well as socio-economic and governance, changes. Some fishers continue to fish without permits, by boat or from the shore. Many fishers keep their entire catch, even if the fish are undersize, so at least they can provide food on the table. They still accept any price from the marketers, as they have no other option. Some fishers work as crew along the west coast. A few participants indicated that fisher families help each other out, but that overall the situation is dire.

With regard to the weather, one positive initiative is the community e-centre (provided by the Western Cape Provincial Government), where computers are available for fishers to browse the weather prediction. A daily prediction is also printed and made available to any local fisher.

***Adaptation strategies and needs***

Access to finance, the opportunity to purchase and use safer and more efficient ski-boats, coupled with some form of preferential access (as envisaged by the new small-scale fisheries policy) are seen as the most critical needs for the Struisbaai small-scale fishers to address their poverty needs and earn a living from their traditional fishing practices. Addressing these needs would also enhance the fishers' ability to deal with the changing fishing patterns. Fishers argued that both the Department of Agriculture, Forestry and Fisheries (DAFF) and the DTI (which have been subsidizing vessels in other communities along the coast) need to work in partnership with the fishers. Chukkie owners are prepared to utilize their old boats in the tourism industry as a way to preserve and exhibit their cultural heritage.

Other strategies that fishers identified were the need to become better organized as a group in order to negotiate better market prices and also be able to leverage funds for storage facilities.

With respect to the regulations, fishers were of the opinion that scientists from government need to work much closer with the fishers, who can collate certain data and also share their local knowledge of weather and fish movement patterns. This increased collaboration would enhance the relevance of local regulations, i.e. species, size and bag limits.

In conclusion, the small-scale fishers of Struisbaai Noord have a high dependence on harvesting marine resources for their food security and livelihood needs. Their strong social, cultural, historical and traditional links to the sea, coupled with their limited asset base and the lack of alternative livelihood opportunities, render them a particularly vulnerable group. Their vulnerability is exacerbated by shocks and trends within their immediate environment (such as competition with other fisheries, limited power in local market structures, limited gear, and lack of access to educational and transport infrastructure), as well as a set of external factors outside the fishery such as environmental and climate variability, and broader governance and institutional processes (Parker, 2013).

### *5.1.3 Saint Helena Bay*

***Overview and livelihood activities***

Saint Helena Bay is located on the west coast of South Africa, about 150 km northwest of Cape Town. The town developed around the pelagic fishing industry, which was highly productive in the 1960s and 1970s, providing several thousand jobs at its peak (Sauer *et al*., 2003). Netfishing (mainly for harders) as well as line-fishing and harvesting WCRL were also important livelihood activities. With the decline in the pelagic and line-fish industry in the late 1990s and early 2000s, several factories closed and many local fishers and fishworkers lost their jobs. However, the coastal property boom, which began around the early 2000s, and the development of a luxury golf estate and holiday homes at Shelly Point and Britannia Bay, both located on the outskirts of Saint Helena Bay, contributed to local economic development and job creation in the area.

As with many coastal towns in South Africa, there are clear socio-economic divisions in this community based on racial lines. Most of the small-scale fishers operating out of Saint Helena

Bay, and the fishworkers working in the factories and at the harbour, live in three settlements (previously coloured areas under the Group Areas Act), namely Laingville, Steenbergs Cove and Stompneus Bay. These settlements are characterized by fairly basic housing (including Reconstruction and Development Programme housing and shacks) and infrastructure, as well as lack of services such as health care facilities and banks. In terms of the 2011 national census, the population of Saint Helena Bay totals 11 529, and although there are no precise figures for the number of residents involved in the fishing sector, information provided in the recent West Coast District Municipality Integrated Development Plan (2012–16), research conducted in 2009 by Schultz (2010) and feedback at the workshop held in November 2014, indicate that 2 000–3 000 people are involved in the fishing sector, of which about 400 can be categorized as small-scale fishers, including 40 who have secured IRPs. Small-scale fishers are involved in line fishing, harvesting of WCRL and mussels, while other community members, mainly women, are involved in post-harvest activities.

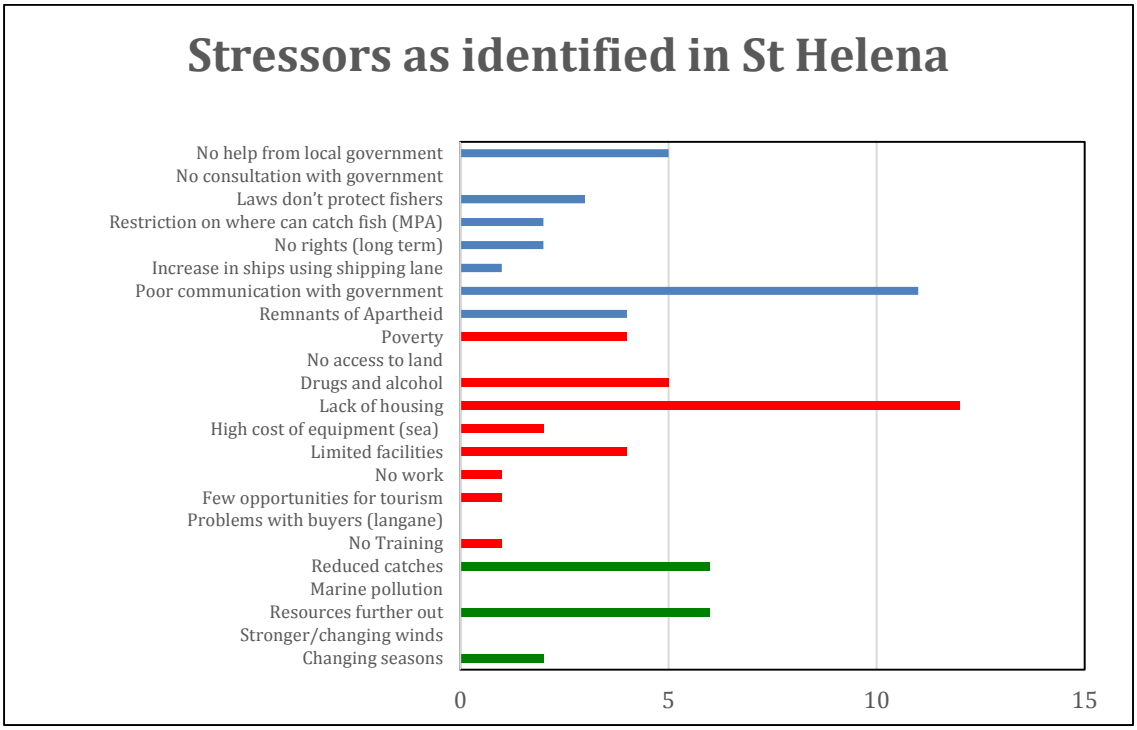
There were 19 participants at the workshop, mostly small-scale fishermen, fishworkers including two women who worked in local fish factories and one that operated as an independent "snoekvlekker"[4] and fish buyer. Other livelihoods that people in the local community engage in include working in a hotel, working as domestic workers in holiday homes, and general work such as painting, construction, and labouring on farms.

***Stressors and vulnerabilities***

Participants identified key stressors under the categories: ecological, socio-economic and management/governance (Figure 16).

**Figure 16**

**Stressors and their relative significance in Saint Helena Bay**




*Notes:* ecological = green; socio-economic = red; governance = blue.

[4] A woman who cleans snoek.

Lack of housing (12) and poor communication with government (11) emerged as the two key stressors facing this community, while reduced catches (6) and the fact that fishers needed to go farther out to sea to catch fish (20–25 nm as opposed to up to 10 nm previously) (6) were identified as major stressors under the ecological category. No assistance from local government (5), alcohol and drugs (5), poverty (4), and remnants of apartheid governance (4) were also highlighted as key stressors facing this community. Other issues contributing to the vulnerability of this community raised under the ecological category included: seasons changing, winds becoming stronger and marine pollution becoming worse. Other socio-economic stressors included limited training, problems with fish buyers, limited opportunities for tourism, limited work opportunities, high costs of equipment to go to sea, limited facilities – bank and clinic, and no access to land. In terms of management and governance, the other stressors identified were: the increase in ships/tankers using the international shipping lane and anchoring off Saint Helena Bay, and so preventing fish from coming into the bay; fishers do not have fishing rights; the marine reserve; the lack of legislation to protect the fishers; and government's failure to consult with the fishers over access and management decisions. There were only three women in the group, and it was difficult to discern which stressors were of particular concern to them as these were spread across all three categories, although most prioritized the socio-economic issues of poverty, lack of housing and alcohol/drug abuse. The "snoekvlekkers" spoke about their precarious livelihood, which was dependent on good catches of snoek in Saint Helena Bay. There are periods when snoek is abundant – up to 50 000 snoek caught by the fishing boats in a day – but then long periods of no fish. Unlike many of the fishers, they do not have the means to migrate to follow the fish.

In the discussion on key stressors, the main focus under the ecological category was on the 1994–95 red tide event, when thousands of WCRL "walked out" of the sea. The fishers claim this event resulted in a decline in WCRL in the area and led to extreme hardship for those families dependent on fish for food and their livelihoods (further detail below). The fishers also complained about the unfair advantage of the WCRL commercial trap boats as they have a larger portion of the total allowable catch (TAC) and are also allowed to fish for a much longer season (30 September – 30 June). The fishers state that by the time the small-scale fishers start harvesting WCRL in mid-November, the commercial boats have depleted the resources.

This group of fishers spoke about the apartheid era as the "green season". Although they welcomed the freedoms associated with democracy, they claimed that in the past people had employment, there was no quota or permit system, ownership of land and resources was not critical in terms of gaining access to marine resources, and there were no drugs or poverty in the communities. In the past, there was also a strong culture of community and sharing. Since 1996, this culture has been eroded by the quota system, and traditional fishing practices such as netfishing have been largely prohibited.

***Historical review of key events and changes***

Fishers spoke of pelagic and line-fish being abundant in the 1960s and 1970s and few restrictions on local fishers. In the 1970s and 1980s, bottom trawling increased and fishers commented on a reduction in fish catches and some species no longer being abundant – hake, horse mackerel, Cape salmon, and mackerel. They referred to the factories discharging effluent into the sea from the 1980s and were concerned that this affects water quality. They also mentioned how the new quota system introduced in terms of the new fisheries dispensation after 1994 has affected their livelihoods. After the 1994 democratic elections, local fishers expected that access to resources would be restored and enhanced but instead the sector has become more regulated. They cite the introduction of the individual quota system as one of the reasons for the breakdown of a culture of sharing in the communities.

The red tide of 1994–95 appears to be the key environmental event that fishers refer to that had an impact on fishing and their livelihoods. After this event, there was a general decline in fishing not only for WCRL but also for species such as kingklip, kabeljou and yellowtail. In addition, the quality of the fish was not good. Fishers spoke of a 14-year period when fishing

for WCRL was poor. Whereas previously fishers could catch 50–200 kg of WCRL in one day, after the red tide event and even today they rarely catch 50 kg in one day. They also highlighted the reduced abundance of species such as hake, horse mackerel and Cape salmon, which used to be very common on the reef running from Paternoster to Dwarskerbos (known locally as Blinders) and the fact that snoek used to be closer inshore. There were mixed responses to the possible reasons for this change in species abundance, some claiming that these reefs had been depleted by trawlers and others attributing it to environmental and climate changes.

Another key event that has affected livelihoods has been the issuing of IRPs in the last seven years, which has created tensions and even conflict in the community. Fishers raised concerns about people in the community that are not *bona fide* fishers and have other work (e.g. teachers) receiving IRPs while others who have a history of fishing or come from historic fishing families have not.

In terms of environmental changes perceived to be affecting livelihoods, fishers spoke of changes in the seasons and the resulting lack of certainty. For example, the north wind does not necessarily signal that there will be snoek. Previously, when the north wind blew, fishers were almost guaranteed of catching snoek on the following days. In the past 5–10 years, this has not been the case and there are many occasions when the north wind blows but there are no or very low catches of snoek. Sometimes, the southeasterly winds bring the snoek, but there are no discernible patterns.

***Impacts associated with environmental stressors and changes***

Participants were asked to focus on the environmental stressors and changes/events and identify impacts of these events and changes to their livelihoods and lives. They were also asked to rate (on a scale of high, medium and low) how serious these stressors/events had been in terms of their livelihoods.

The first environmental stressor or change noted was that **catches were declining**. Fishers claim there are fewer fish caught now than in the past, and this means less money available. Lower catches are attributed largely to the presence of trawlers, pelagic boats and WCRL commercial trap boats in the vicinity of Saint Helena Bay. In particular, the pelagic boats catch anchovy and sardines (food for the snoek), which affects local line-fish catches. The demarcation of the international shipping lane (about eight miles offshore) was also seen as a factor affecting catches. According to the fishers, the anchors of these boats (there can be 10–12 at anchor) destroy and disturb the sea-bed habitat, thus affecting catches. With the closing down of some factories and increased unemployment levels in many of the coastal towns in the late 1990s and 2000s, there has been a breakdown of social fabric owing to increased alcohol and drug use as people struggle to make ends meet. Less fish means less work, less money and higher levels of poverty in the community. People have to "pas jou maag aan by jou sak" – "adjust your stomach to match your pocket". This stressor was ranked high.

The second stressor identified, **change in seasons** and unpredictable weather patterns, created a lot of uncertainty, as fishers could no longer plan. As mentioned above, the north winds no longer signal the arrival of snoek, and fishers cannot afford to buy petrol and go fishing without some certainty that they will catch enough fish to cover these costs. There are unseasonal winds, e.g. the southeasterly may blow in winter and bring snoek. From the fishers' perspective, the seasons are changing due to "global climate change" and the fishing industry and its associated activities (both sea- and land-based) are contributing to global warming. In this regard, the small-scale fishing sector was considered a more environmentally appropriate sector. This stressor was ranked high.

The third stressor was the fact that **resources/fish were now found farther out at sea.** Many fishers cannot afford the costs associated with equipment required to be seaworthy especially, the engines and safety equipment. Going farther out means that fish become "pap" and lose quality, and some die at sea before they can be landed because of the lack of freezing facilities at sea. Some fishers have had to sell their boats and work on other fishers' boats or look for

other work. Many have fallen into debt with boat owners or buyers and then indebted had to sell their fish to them at fixed prices the following season. Moreover, non-permit holders cannot operate under a recreational licence as these permits prohibit the sale of fish, and even if they did sell their catch, the restrictions on numbers of WCRL and line-fish species allowed per day would not cover the costs of the fishing trip. This stressor was also ranked high.

In terms of environmental events, **the red tide of 1994–95** was highlighted as a major event that resulted in extreme hardships in the fishing community. The decline in resources resulted in food insecurity and increased levels of poverty in the community, and fishers and fishworkers would harvest resources such as mussels, kelp and seabirds for food during these difficult times when no fish was available. They spoke about how these difficult times affected community and personal life as some were forced to beg. They highlighted the fact that red tide events were a feature of the west coast marine system this event was the most extreme in living memory. They concluded that this extreme red tide was probably exacerbated by global warming.

***Coping mechanisms***

**Red tide and reduced catches**

In terms of the key environmental stressors identified, participants indicated that the decline in resources after the red tide event forced them to "poach" in the marine reserve as well as eat mussels, "klipvis", limpets, kelp and even seabirds (including cormorants and penguins). These were desperate times and fishers would even resort to stealing to be able to buy food for their families. Although the red tide was a particular event that could be identified, the decline in fish availability generally was an overriding concern, and fishers had to do whatever was required to find food and make provision for their families. They would harvest whatever resources they could find from the shore (as above), "poach" WCRL and other species from the marine reserve. This resulted in fines, which they could not afford and so many ended up in jail with dire consequences for their families. Some looked for other work although this was limited, and some would migrate after the fish. Some would move home and live with other family members. From their perspective, none of these coping mechanisms was workable and it was a case of surviving.

**Changing seasons**

There were no clear responses to the changes in seasons as there was uncertainty regarding what conditions would secure good catches. Fishers would need to communicate with each other more closely to find out whether it was worth going out to sea. However, aside from this, the responses were similar to the other changes, with one fisher indicating fishers would resort to "stealing, begging and housebreaking" if they were desperate. Some indicated that they would take whatever other work was available – on surrounding farms, in construction and for the municipality but these were usually part-time and short-term jobs. Thus, again, no coping mechanisms employed that they would wish to develop further.

**Resources farther out**

Some fishers sold their equipment and even their boats and worked on other fishers' boats but this was not desirable at all. This was done in order to survive. Others indicated that they borrowed money from buyers to pay for petrol and safety equipment but this created a situation of indebtedness. There are no coping mechanisms that are working for this community, and it is difficult to help another fisher especially if he does not have a permit, as those helping will also be fined.

***Adaptation strategies and needs***

During the workshop, participants identified a number of strategies that they believed could enhance their resilience to their vulnerable situation. All were strategies they suggested, none had yet been implemented. These strategies were listed and discussed in the final session (Table 4).

**Table 4**

**Adaptation strategies and needs suggested by fishers, Saint Helena Bay**

| ***What strategies are working / could work?*** | ***What support do you need?*** | ***Support from whom?*** |
|---|---|---|
| Larger boats (6-crew boats) – to catch line-fish and WCRL | Money, boats, transport and equipment required | DTI, IDC – for multiple support |
| Need technology and equipment (e.g. GPS, computer, Internet access) | Need funding for technology (e.g. GPS) | DTI, IDC and local cooperative – for multiple support |
| Identify and develop supplementary livelihoods (e.g. training to become divers to work on diamond boats) | Training and skills development for other professions / work opportunities | IDC, local government, diving units |
| Organized fishing communities – need to work together, build trust is a priority | Better-organized communities able to demand rights. Training workshops on community development and organization | DAFF, DTI, DEA |
| Training and capacity building (e.g. community organization, use of new technology, monitoring resources). Must be at right time and designed with fishers. | Must be some incentive to attend training; it must be relevant and worthwhile. | DAFF, NGOs, GEF (funding), UCT (universities), diving units – training |
| Improve facilities and infrastructure including access to coastal land. (Need facilities to clean, wash and process fish – also to take ice to sea) | Storage, processing, cleaning and sheltering facilities | Public works, DAFF, retailers |
| Improve marketing of fish – "environmentally friendly" to local and international markets | Once facilities and infrastructure improved, need assistance to access markets both in South Africa and international markets | Public works, DAFF, retailers, NGOs |
| Better support to deal with substance abuse | Better rehabilitation centres with proper follow-up support, community support for families | Communities, social development, local government |
| Declare an exclusive small-scale fisheries zone | Fishers need to be better organized and trained to deal with DAFF | DAFF, DTI, DEA |
| Implement the small-scale fishing policy | Fishers must become organized and capacitated to engage and work with DAFF and other relevant departments and agencies | All social partners |

Fishers agreed that becoming more organized and capacitated to engage confidently with the DAFF, Department of Environmental Affairs (DEA) and other stakeholders regarding their rights and socio-economic needs was probably the most important strategy at this time. Access

to new technology and equipment such as larger and more seaworthy boats (for six or more crew), GPS, computers and the Internet (to check weather reports) would enable them to better deal with the unpredictable weather conditions and the fact that the fish is caught farther offshore. Involvement of fishers in resource monitoring is desirable, and the DAFF and research groups should provide equipment and training and facilitate this process. While the Masifundise Development Trust and Coastal Links are playing an important role in building individual and organizational capacity in west coast fishing communities, the process is slow, and there is a lack of resources for training courses and skills development. Moreover, conflicts among certain fisher groups and individuals in Saint Helena Bay have required facilitation to bring the community together. In addition to the support required from the key government departments of DEA, DAFF and DTI, fishers also identified NGOs (Masifundise Development Trust) and Coastal Links, as well as university research groups such as the EEU (now Coastal and Small-scale Fisheries Research Group in the Department of Environmental and Geographical Science) at UCT and the Institute for Poverty, Land and Agrarian Studies at the University of the Western Cape, as important support partners especially with respect to becoming organized, capacity development and skills training. The local cooperative should also be capacitated to provide support to fishers. With respect to reduced catches, fishers recognized the need to seek supplementary livelihoods, although aside from professional diving, few alternatives were identified. Local government should play more of a role in this regard.

Improving infrastructure and facilities to support post-harvest activities was considered a very important strategy to deal with reduced catches, as this would enable product beneficiation and improve marketability of fish locally, within the Cape Province and internationally. Fishers need more information and training about producing "local sustainable seafood" and need government and private sector support to assist to improve marketing of their products.

Addressing drugs and alcohol abuse in the communities is critical in order for this community to deal with current and future vulnerabilities. Building skills within the communities to deal with these problems as well as improving facilities at local rehabilitation centres is required. The Department of Social Development as well as the relevant departments in local government have an important role to play in this regard. Improving communication and coordination across government departments to support adaptation strategies identified above are considered important so that these problems can be addressed in an integrated and holistic manner.

Implementation of the new small-scale fishing policy (DAFF, 2012) and the declaration of an exclusive small-scale fishing zone would be an important first step to reducing vulnerabilities and protecting small-scale fishers. The DAFF and DEA would need to work with the local fishers in order to clarify the boundaries of the small-scale fishing zone, and agree on the regulations that would apply in this zone in a manner that would respect the rights of the fishers but also the conservation objectives.

## 5.2 Namibia

Two case studies were selected in Namibia: Walvis Bay and Henties Bay (Figure 17).

**Figure 17**

**Namibia case studies**


### *5.2.1 Walvis Bay*

***Overview and livelihood activities***

Walvis Bay is a well-known harbour town located along the Namibian coast. Although industrial fishing is the town's economic mainstay, other industries such as tourism, transport and services have become equally important. Among the fishing activities, line-fishing either as recreation or sport fishing, is considered important. Another sea-related activity is that of the collection of shells along the coastline for making jewellery called "Onyoka".

Onyoka, a traditional necklace made from mussel shells, is common jewellery among the Oshiwambo-speaking people. The more strings you wear, the wealthier you are. The father of a newborn child offers the necklace as a gift to his wife and her family as a gesture of respect and as acknowledgement of his fatherhood. The child must wear the necklace until his or her marriage, preserving it until his or her passing, at which time the Onyoka is returned to the mother or to the maternal side of the family.

In Namibia, the practice has been carried on for years and the production of this jewellery is still very important to the Oshiwambo-speaking people. The use of seashells to make this jewellery has created a means to generate income for a number of women, who have moved to the coastal towns wholly to do this business. With climate change and other anthropogenic effects changing the oceans, these women face challenges as they continue making a living from these shells. Because these women depend on the sea for their livelihood, they are beneficiaries of marine resources and, therefore, stand to suffer the consequences of climate change (changing currents, shell deposits, shell quality). Assessing their vulnerability and

adaptive capacity to climate change will provide insight, as they are one of the coastal communities involved in fisheries activities.

There were 49 participants at the workshop; all of them shell-collectors, and all women. Not all small-scale fishers from Walvis Bay were invited to the workshop, as the focus was on the female shell-collectors as their practice was believed to be a unique case study. Of those who indicated their age (more than half of participants), the youngest was 19 years old, who came to act as translator for her mother, and the oldest was 52 years old. Most of them were in their thirties or forties and a number of them attended with their babies or grandchildren as they have no one to take care of them. They found it important to attend the workshop.

The female shell-collectors are mostly Oshiwambo-speaking. Most are based in Walvis Bay, but two participants travelled from Swakopmund. They collect shells along the Namibian coast, mainly between Walvis Bay and Henties Bay, which is a stretch of more than 100 km of Namibia's 1 500 km of coastline, and travel by taxi to different preferred beaches. Most of them operate individually, but on several occasions they operate in groups when they are going far from their homes. Their operations involve collecting shells from the shoreline, processing these at their houses and travelling to the northern regions of Namibia where the product is mainly sold. The sales are mainly contacted on a door-to-door basis, but at times they can sell at open markets and/or gatherings where older people and people in receipt of government social grants go to receive their monthly funds. Because of all the long-distance travelling they have to do before a single 30-cm-long piece of the necklace is sold, financial support is their main need, be it for transport or other logistics. Participants indicated that this need is intensified by the fact that all the work has to be done first before any money is made out of the product, a process that is long and spans a huge geographical space.

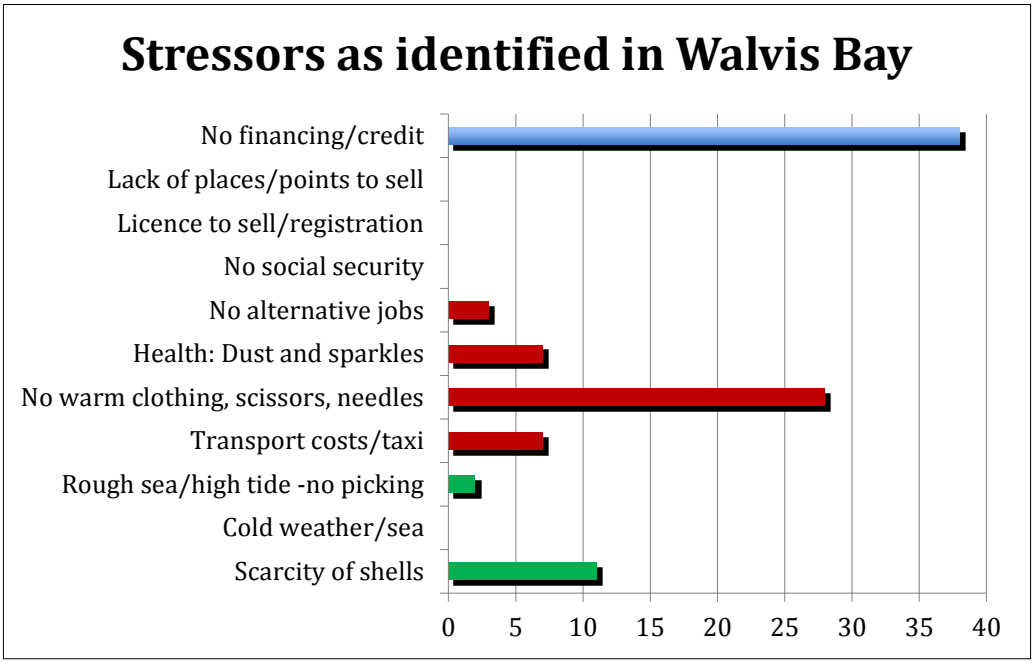
During their operations mapping exercise, they pointed out that the Landstrand and Diphon Park areas between Walvis Bay and Swakopmund have been the best collecting sites for a long time. They also indicated that collection of shells as well as sale of the jewellery has extended as far as into Angola. Most of them have no alternative jobs or sources of income, and because of the nature of the oceans low and high tides, they have to make several visits per day to the sea, with the hope that there might be new shell deposits. Not going to collect shells frequently is not an option as shells do not really accumulate (deposited at low tide and washed back in the sea at high tide), and if one does not go and collect what is deposited that day, others will. They highlighted that this nature of frequent visits and word of mouth (when there are good deposits of shells) makes it difficult for them to engage in alternative income-generating opportunities although they would welcome such opportunities.

***Stressors and vulnerabilities***

Participants identified and then ranked key stressors under the categories: ecological, socio-economic and management/governance (Figure 18).

**Figure 18**

**Stressors and their relative significance in Walvis Bay**




*Notes:* Blue = governance; red = socio-economics; green = ecological.

In the ecological category, the most important challenge among the female shell-jewellery-makers is the perceived scarcity of shells in terms of both quality and quantity. In areas where many shells can be found, they are very brittle and not the kind (*Donax* spp.) that gives the best jewellery product. This is mostly the case in the Henties Bay area. In the Walvis Bay and Swakopmund areas, white mussel shells are almost depleted completely, to the extent that the women now have to make up the volume with black mussels, a practice that compromises the colour/quality of the final product. Rough seas have become more frequent and intense, which makes it risky or even impossible to collect shells. The last stressor in this category was identified as the cold weather and cold sea, making collection work uncomfortable and a potential health risk.

The main stressor identified in the socio-economic category was the lack of protective gear/clothing and appropriate equipment in the form of scissors (their main instrument), needles and drillers. Second was their compromised health owing to the shell fragments that fly off during the cutting process and could damage their eyes, as well as inhaling dust emitted during the process of drilling the hole and smoothing the shell edges. Transport costs, mainly in the form of taxi fares to the collection site or to the northern regions to sell the products, were also highlighted as a stressor. The lowest-ranked stressor in this category was the lack of alternative jobs, confirming the participants' view that collecting shells for jewellery is still a good income-generating activity for them.

The women unanimously ranked lack of finance and/or access to credit as the main management/governance category stressor (no other stressors in this category received a ranking). They identified this as a governance stressor as they argued that the government needed to recognize their sector so they could obtain access to credit. Because the process of making this jewellery requires good capital before the sales are realized, having no such capital hampers profitability. Other stressors in this category are: lack of selling space or designated selling point, and lack of a licence to sell or any kind of registration that makes their business recognized and therefore able to sell their products in formal outlets. These stressors have

resulted in the jewellery marketing and selling being very labour-intensive, as the women have to do it on a door-to-door basis. The final stressor in this category is the women's inability to register as social security members. Being a member of the Social Security Commission (SSC) has benefits mostly for women requiring maternity leave, as well as disability and funeral benefits. Seeing themselves as self-employed women, they wish to be recognized as such and be allowed to register as SSC members. The SSC accepts members who have proof of employment, and members pay a monthly contribution on top of what their employer contributes.

For the jewellery-making process as a whole, the women raised concerns that, besides the cultural significance of their business, this workshop was the first to have brought them together. Although they acknowledge that they have not encountered disputes with the authorities (local or national authority), they feel neglected, as no one has tried to talk to them. There were no male participants at the workshop, and it was indicated that men have never participated in this shell-collecting activity. However, men have participated indirectly as transport providers.

***Historical review of key events and changes***

The shell-collectors identified several environmental changes that had affected their jewellery-making practices, especially in the light of availability of shells (quality and quantity), as well as increased distances (changes in collection spots and the market). Three periods were highlighted: pre-1998; 2004–2012; and from 2012 to the present.

Participants agreed that Langstrand (between Swakopmund and Walvis Bay) was the best place to collect shells before 1998. At that time, shell collection was always good because shells were abundant and few people engaged in the activity. Shells also used to be aggregated and therefore easy and fast to collect. This period is also remembered because the quality of shells was good, both in the strength/texture and the colour. As there were not many people in this business, there was no competition and therefore one could sell at very good prices. Customers were the ones looking for the jewellery-makers and therefore selling was easy and profitable.

From 2004, more people started to make the jewellery and, at the same time, women started to notice that "the sea did not deposit as many shells as it used to do". The quantity of shells along Langstrand also meant that a person did not need to travel to the Swakopmund areas to collect shells. Deposits of shells comprised more black mussels than the white ones, which make the best and preferred jewellery. Because of the scarcity of good white mussel shells, people started mixing with black shells and the quality of the end product changed. Unlike in the past when customers looked for the sellers, sellers now needed to travel to the northern regions, which brought new problems (transport costs). The main users of this jewellery are based in the north. With development, new marketing and selling opportunities were created, such as annual trade fairs and various expo initiatives, but the women expressed their frustration that, in most cases, they did not have a chance or permission to go to sell and market their product at such events. By this time, their market had expanded into Angola, which resulted in more capital cost, as they had to pay for a place to sleep and they did not have money to pay for accommodation as they had not yet sold their products. In this period, as was the case in the previous one, no one was really interested in alternative jobs because they could make a living from the practice.

Since 2012, the jewellery-making business has started to become more difficult and unsustainable. Shells have become very brittle and now break more often during the process, such that out of a big bag, one ends up with only a few useful pieces by the time they have been drilled for wiring. Shells have become more available around the Henties Bay area and scarce around the Langstrand and Swakopmund areas. No shells at all are found around the Dolphin area. One key concern the women raised is that Henties Bay shells are softer than others, perhaps because they are a different species to the ones in the Swakopmund and Walvis Bay areas. As an adaptation mechanism, the women now mix different shells (from different areas and different species), a step that has compromised the quality of the product, thus resulting in customer dissatisfaction. Selling is more difficult now than before owing to competition, the

same market prices and poor product quality. Other developments include an increase in using freshwater shells from Angola and the Kunene River and the processing of Ondjeva (a waist jewellery) from ostrich eggs has become popular, but it is only done by those who can afford to buy ostrich eggs, which are very expensive.

***Impacts associated with environmental stressors and changes***

This exercise consisted of asking the participants what direct and indirect impacts the environmental changes had caused on their lives and livelihoods, and what they thought had caused some of these changes or triggered the specific events. These stressors are summarized in Table 5. The reasons given to be the cause of those stressors all referred to changes in the environment, especially climate change.

**Table 5**

**Summary of impacts associated with environmental stressors as identified by female shell-collectors in Walvis Bay Namibia**

| ***Environmental event/change/hazard*** | ***Direct impact?*** | ***Indirect impact?*** | ***What do you think caused these environmental changes?*** |
|---|---|---|---|
| No shells in Langstrand | Nothing to do / travel long distances | No money will be generated from jewellery-making because of lack of transport or money to go to collect shells farther away | No wash-up / change in climate (weather) |
| Shells farther away | High cost | Dependence (to go in groups) | Lack of knowledge when shells should be there |
| Less/more wash-ups | Many trips / nothing to do / use money for something else | Nothing to do / no money generated | No information on weather and causes for shell wash-ups |
| Quality of shells (black shells break) | Less jewellery, more dust, more particles, which can cause eye infection from dust. | No money generated, cost incurred for nothing, health problems, tuberculosis from increased dust as one processes shells | Weather/climate change |
| Rough seas | No picking, no shells even after travelling to various locations, close or far. | Financial loss/transport cost, time loss (nothing more can be done) | Shells get washed back in the water |

***Coping mechanisms***

The women identified very few current coping mechanisms. Alternative jobs have now become important to the women in this jewellery-making business. Some of them travel to the northern regions to work in the fields when they do not find any shells, and because they do not have money to buy ostrich eggs to make waist jewellery. Some of them stay and engage in Kapana (selling food/meat on the roadside) because they have to pay school fees. Those with money remain and buy ostrich eggs to make Ondjeva.

Lack of finance to travel to customers hinders their business. Sometimes, they will have a pile of their finished products with them in Walvis Bay that they cannot sell unless they are moving about to engage with customers. Participants indicated that they need money to buy a permit/licence to sell at various places that are only used by permit/licence holders.

***Adaptation strategies and needs***

A number of ways to cope were proposed by the women, in most cases provided that there is start-up capital. They could: (i) buy ostrich eggs to make the waist jewellery (Ondjeva); (ii) use freshwater shells from Okaluheke; (iii) collect shells, as far as shells can be found; (iv) borrow money from financial institutions or friends and relatives, but this could lead to debt; (v) buy shells from Angola; (vi) sort the black shells and find the fewer good ones although this could compromise the quality of the end products; or (vii) exit the jewellery-making business to find work elsewhere.

The use of different materials (ostrich eggs, black shells, freshwater shells) is seen as the option to keep the practice going. The groups suggested that they could adapt if they could be helped with acquiring finance, new materials and money for transport, business training, training in product diversification / value addition (earing, bracelets), training in planning and budgeting, and training in marketing. They also felt that they could look for work inland if they could find opportunities for the following: training in agricultural good practices; new projects, e.g. chicken farming, flowers, fruits, catering, gardening, sewing, and preparing fields; and be provided with farming areas. This support was requested from the government, private institutions and the business community. They would appreciate any machinery that could improve their efficiency, as they are now sharing equipment and the owner charges a renting fee. The waiting period before one's turn delays production.

They could travel along the coast to look for shells farther away. However, they need assistance with accessing transport and accommodation. The women made a request to the business community in assisting with transport or funds so that they can collect shells farther away than they do now. The ability to find accommodation at those places would also lessen the risk they take to travel at odd hours.

They could explore new markets (national and international) and sell to tourists near Walvis Bay harbour, but in order to do this they need permission/access. A request was made for Namport to allow the women to sell their products to tourists. Institutions responsible for organizing expos and trade fairs were also requested to allow them a stand to exhibit their jewellery there.

Having more materials and gear, mostly warm clothes and nose masks, will reduce the health problems/risk they face, and they need such support. Grant assistance and donations for protective clothing was requested from the business community or any willing individual or institution.

Having a job to supplement the income they make from this business will improve their livelihoods. The women suggested that the fishing industry could employ them for casual or seasonal work so that they can have another source of income in case the business has not produced enough. The community in Walvis Bay and Swakopmund was also requested to assist with domestic work for the women.

Participants felt strongly that their business would improve if their practice were recognized by the authorities. They are therefore requesting assistance in becoming recognized as another entrepreneurial activity. The Ministry of Trade and Industry has been requested to assist the group by granting them recognition as entrepreneurs. With such recognition, they will be able to gain chain benefits of a recognized and registered business.

All women felt that they wished to be recognized as self-employed people. They are therefore requesting that this shell-collection and jewellery-making activity be a recognized business. The SSC has been requested to allow those willing to register as members a chance to do so. The women are willing to pay the monthly membership fee. Most participants felt that this was the one organization that would benefit them the most.

In conclusion, the female shell-collectors argued that they were keeping the culture and tradition of the Oshiwambo-speaking groups alive, although they have a dependence on harvesting marine resources along the Namibian coastline. Although their practice has not attracted the attention as a means of utilizing the ocean to make a living, they are willing to keep the Ondjeva jewellery culture going. Their strong social, cultural, historical and traditional links to the sea, coupled with their limited capital, and the lack of ocean and oceanographic understanding render them a particularly vulnerable group. This group's vulnerability is exacerbated by dynamics and trends within their immediate environment (such as ocean acidification, increased sea tides and waves, competition with other jewellery-makers, limited processing equipment and gear, and lack of access to educational and transport infrastructure), as well as an inability to belong to any formal institution.

### *5.2.2 Henties Bay*

#### *Overview and livelihood activities*

In Namibia, recreational angling is important both as a use of marine resources and in attracting tourists. More than 90 percent of angling takes place in the Dorob National Park, previously the West Coast Recreational Area. Most of the remaining coastline is closed to recreational fishing to provide the most sought-after species with important refuges. Recreational angling is an activity undertaken mostly by Namibians (inland visitors to the coast 36 percent, local coastal population 16 percent of fishers) and South Africans (46 percent of all fishers). The estimated value of recreational fishing to the economy grew from about NAD26 million (4,3 million USD at the time) in 1999 to NAD56 million (4 million USD) in 2006. The recreational fishery targets many of the species targeted by a relatively small group of shore-based small-scale fishers using rod and line: kob, also known as kabeljou; west-coast steenbras, also known as white fish; galjoen; blacktail, also known as dassie; and snoek. A limited amount of recreational crayfish harvesting by snorkelling takes place from the shore in the central area.

Henties Bay is a well-known recreational fishing town located on the Namibian coast. The town has also become a popular coastal holiday destination and retirement location. Recreational angling or sport fishing makes an important contribution to the economy of the town, for both the locals and visitors. As a result, a relatively large number of small-scale Namibian fishers are found in this town. Their livelihood and income generation is wholly dependent on recreational fishing activities. Small-scale line-fishers are not recognized by law in Namibia, and most operate with recreational licences.

The Hanganeni Artisanal Fishing Association (HAFA), at Henties Bay in the Erongo region, is a community-based fisher association that assists the previously disadvantaged community to engage in economic activities. It was established when the Ministry of Fisheries and Marine Resources, Spanish Embassy, Spanish Agency for International Development Cooperation, World Wildlife Federation and the Henties Bay Town Council gave NAD3 million (375 000 USD) to the project in 2001, and the project created employment for more than 70 people. The money was intended to set up a facility comprising a factory, cold storage and a fish shop. The association was initiated with a view to developing a community-based organization that would assist the previously disadvantaged Omdel community of Henties Bay to address the issues of

unemployment and income generation from marine resources and ecotourism. To assist HAFA's operations, the Ministry of Fisheries and Marine Resources granted exploratory rights to the project with the aim of catching fish along the coast using fishing rods. The Ministry also gives HAFA a hake quota as an extra source of income. Members of the association received training in navigation, fish sales and processing.

There were 26 participants at the workshop; 10 were women who were either fishers or worked in the fish shop. Of the male participants, the majority were operating under HAFA, while others operated independently as private individuals. Two participants from the Inspectorate Department of the Ministry of Fisheries and Marine Resources also attended. Some participants operated as both active members of HAFA and also as independent fishers. One participant operated with his own ski-boat. The ski-boat fishers play an important role in this fishery, although participation from this group was not really part of the workshop. The majority of participants attended both days of the workshop.

Small-scale fishers from Henties Bay are mainly line-fishers operating from the beach. They travel to their fishing areas on foot, by bicycle or by car. Those operating under HAFA are transported in its car and are thus able to travel to other fishing grounds, while those operating independently are mainly restricted to the Henties Bay coastal area.

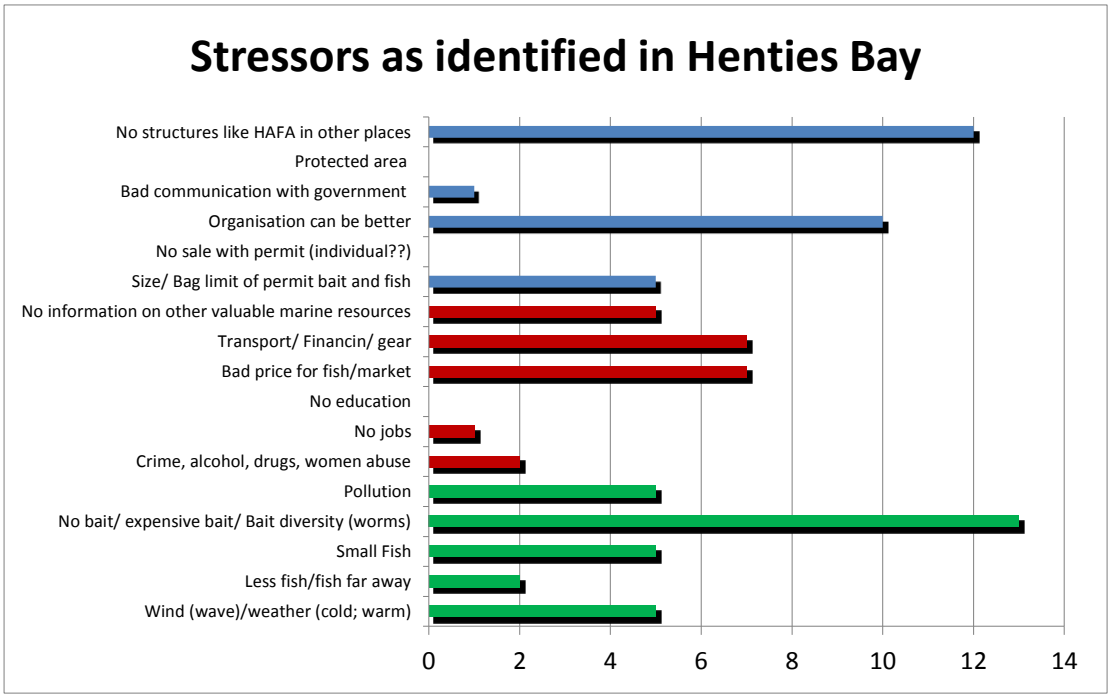
During the mapping exercise, participants highlighted the lack of alternative income-generating opportunities besides fishing. Some community members have temporary or permanent jobs only during peak tourism season as gardeners or work in accommodation outlets. A key insight from the mapping exercise is also the remoteness of this town in terms of availability of jobs, especially when fishing is not good.

***Stressors and vulnerabilities***

Participants identified and then ranked key stressors under the categories: ecological, socio-economic and management/governance (Figure 19).

**Figure 19**

**Stressors and their relative significance in Henties Bay**




*Notes:* Blue = governance; red = socio-economics; green = ecological.

By far the most important challenge for Henties Bay fishers related to the permit conditions restricting use of certain bait organisms. In the fishers' view, these restrictions were the cause of poor catches. Participants asked the Ministry of Fisheries to allow them to catch worms as bait, as they are believed to be more effective. Fishers believe that with decreased abundance of preferred species, they need to use worms in order to be more selective. Other challenges under this category were the fact that catches comprise more small fish than previously, but because of the regulations, they have to immediately return them to the sea, otherwise they will be fined. This regulation leads to a situation where a fisher may catch a lot of fish in a day but will go home with nothing because they were all undersized. Pollution and bad weather conditions were also highlighted as key stressors, mostly that wind and wave conditions have changed and they influence catches a lot. There are also changes in sea and air temperature, which fishers claim affect both the catch and the working environment when it is either too cold to fish or too warm during the east wind periods. Another ecological stressor identified was the perceived shift in the distribution of fish. Fishers claim that there are fewer fish in coastal waters adjacent to Henties Bay, and they need to travel farther out to the north where fish are more abundant.

With regard to the socio-economic category, vulnerabilities that emerged from this exercise were: (i) the lack of access to finance to purchase necessary gear (good fishing rod or protective clothes) as well as transport or money for transport to reach better fishing areas; (ii) low prices for the fish (access to good/profitable market); (iii) lack of information on other valuable marine organisms that fishers could exploit; (iv) crime, alcohol, drugs and abuse of women; (v) overall lack of job opportunities; and (vi) lack of education to allow fishers to look for alternative employment This category saw a separation in stressors identified by those operating independently as opposed to those operating under HAFA. For example, independent fishers ranked transport as a main problem, while those from HAFA had no problem with transport as the association transports them to and from fishing grounds. Similarly, the need for better gear was more of an issue for the independent fishers as HAFA provides its fishers with equipment. However, independent fishers did not identify with low prices as much as those operating under HAFA because they sell their catches at a price mutually agreed upon with the buyer, unlike a regulated price and commission at HAFA. It appeared as though stressors in this category played a large role in fishers deciding whether to join or leave HAFA.

In the management/governance category, concerns about the regulations set by the Ministry of Fisheries and Marine Resources were emphasized. The lack of initiatives such as HAFA in other areas was identified as a management issue. Fishers believe that the establishment of more fishers associations will assist other fishers in towns such as Walvis Bay and Swakopmund, where a number of fishers who use bicycles as transport would receive similar benefits. Despite the fact that several participants operated under HAFA, the second-most important issue raised under this category was that HAFA as an organization was not operating efficiently. Under this stressor, participants raised issues of salaries, benefits and job-security differences between fishers and those in the administration or factory operation of the organization. Fishers only receive a commission on their catches, while others have a secure fixed salary. Fishers felt that their operations were the most important for the overall operation of HAFA, yet they received the least remuneration. The bag limit as per the Fisheries Act was raised as a problem because ten fish per person per day is regarded as too few to make a living. Limits on bait (the type of bait and numbers one can harvest) were also identified as a limitation on fishing operations. Participants voiced their concern about the issue of poor communication between themselves and government, especially fisheries inspectors. Participants highlighted the Fisheries Act regulation that prohibits fishers operating under a recreational licence from selling their fish even if it is caught with a valid permit. This has resulted in criminalizing the sale of fish by independent fishers, while HAFA has a permit to sell the same fish. The group requested that government review this regulation as it renders their operation illegal. The final issue raised under the governance category was the issue of the declaration of protected areas in the line-fishing grounds. Fishers indicated that these areas are fishing hotspots and closure of these fishing grounds would have a big impact on their livelihoods. Fishers in Henties Bay also

complained about the top-down management approach of the fisheries authority and the lack of consultation and transparency with regard to the regulations.

Although women were present at the workshop (all were operating under HAFA), they did not raise gender-related issues but indicated that they were more vulnerable because they had a lot of domestic work to do every day at home before and after their fishing activities. This included arranging day-care for their children, leaving food prepared or preparing food after a long fishing day as well as all other household chores. One thing that was discussed at length, which seemed to speak more to gender differences, was that women found the fishing day extremely long and left little time at home with their children. They indicated that they would like to find an alternative source of income, but agreed that fishing was an activity they enjoyed doing.

***Historical review of key events and changes***

Fishers identified several changes in the weather patterns that had affected their fishing practices and catches, especially in the light of shifts in fish distribution and how well fish bite. Participants spoke of a good fishing environment before 1990 when the weather was good, fish used to bite well, hotspots were at their doorstep and fish were large. They indicated that bad weather was only observed in August when the east winds would occur. They operated individually as there was no organized initiative such as HAFA. The months of February–May were the best time to catch galjoen, June–August were good for steenbras while the months from September to January were the best season to catch kabeljou and blacktail.

Participants spoke of the colder water that is being experienced, which they say mainly favours galjoen. Waves and tides are perceived to be larger and stronger than before. More species have become part of their catches (less targeted fishing) and the fish caught are smaller in size most of the time. There is no clear seasonal separation on what species are dominant at any particular time of the year. Members of HAFA spoke of having a better working environment, as they are supplied with gear and transport. Participants highlighted the fact that certain fish species are now found farther away, with some of them suggesting that overfishing may have caused the depletion of local fishing grounds. The observed increase in the number of recreational fishers was also identified as a possible cause of fish decline in the Henties Bay areas. Fishers spoke of the best fishing areas around Mile 72, as opposed to earlier years when one did not need to go that far. Good fishing is now found at areas north of Henties Bay. Bait has also changed due to changes in availability, and other species such as barbel are now a target, which was not the case before. The introduction of permits and fishing regulations by the Ministry of Fisheries and Marine Resources has changed the fishers' operations a lot – that they are no longer allowed to sell their fish to retailers and individuals legally, and the limit on number and size of fish per permit holder has decreased.

Overall, fishers agreed that the weather had become more unpredictable, changing every few days instead of weeks. There appeared to be more southwesterlies than southeasterlies. They spoke of long calm misty conditions in the past, while now these periods are often disturbed by strong southerly winds.

***Impacts associated with environmental stressors and changes***

The group was asked to focus on the environmental stressors and discuss what direct and indirect impacts the environmental changes had caused on their lives and livelihoods, and what they thought had caused some of these changes or triggered the specific events. Four events were highlighted.

**Fewer fish of all species** has resulted in them losing a source of income, not having fish to feed their family and, as such, this has an indirect impact on how much food they are able to buy for their family. The reasons given for a possible cause for this are water pollution, increased number of seals, more fishers, more boats and marine mining / oil drilling.

The shift in the distribution/availability of fish (fish farther away) has resulted in the increased cost of fishing mainly due to fishing farther out and longer fishing days. Indirectly, this results

in a loss of jobs (HAFA), hunger while fishing, and loss of markets because by the time one returns to town, it is late and customers have left selling points. The possible causes of these impacts are: more people than before are fishing from this coast, climate change, people are catching undersized fish and keeping them, and holidaymakers are catching more fish than local fishers due to the greater efficiency of their gear.

Fish that are caught **are often undersized**. If released, fishers will not have food; however, if they keep their catch, they believe this will have a negative effect on fish stocks. In addition, fishers need more bait to ensure a reasonable catch, which leads to bait being more expensive. Indirect impacts associated with the above include less income, participating in illegal activities such as keeping undersized fish, or using illegal bait such as worms, or collecting more white mussels than allowed, which results in fines. Fishers believe that these changes are exacerbated by tourists who come and fish heavily in their fishing grounds (locals are unable to fish in these areas as they have become tourist camping areas). Participants also believed that different industrial vessels are catching fish of all sizes and do not release undersized fish.

The fourth environmental stressor identified was changes in environmental conditions, changes in wind and wave conditions as well as sea and air temperatures. Participants felt that these changes have resulted in less fishing time, health issues due to cold/windy conditions, and a need for warmer and protective gear, mostly for the women when they have to fish far away. These impacts have resulted in less income and loss of customers.

***Coping mechanisms***

Due to the isolation of the town and its main economic activities, fishers felt that they had very few options to cope with the environmental, as well as socio-economic and governance, stressors and changes. Some of the alternative activities they identified included: find other jobs or create alternative income from other ventures (e.g. a bar, a day-care centre, sell vetkoek), look for casual work in gardening, or do nothing. Others buy snoek from commercial shops to resell it and make money to go and fish farther away, fish at night for barbel to feed their family, hunt for geese, and collect bait to sell or exchange with fish. In some instances, fishers indicated that they become angry, which results in domestic violence and alcohol drinking. Some alternatives are of the illegal nature, whereby fishers collect prohibited bait to sell or use, and stealing and retaining undersized fish.

Those with HAFA felt that the HAFA initiative is only working for the full-time employees who have a secure salary but not for the fishers who still depend on how much fish they catch. There was a view that governance is not really working for the fishers. Participants felt that most of the alternative activities they have tried have not really worked because everyone is now doing the same activities and, therefore, there is a lot of competition. Because of the Fisheries Act, most alternatives result in illegal activities that lead to a risk of a large fine. There was a strong admission by some of the participants that despite the risk of being fined by the Ministry of Fisheries and Marine Resources, they cannot just allow their families to go hungry if they do not catch anything of legal size to sell and obtain money to buy food. Because they have a responsibility to feed their family, they sometimes (perhaps more often than not) retain undersized fish to sell or eat.

***Adaptation strategies and needs***

Fishers identified strategies that they believed could reduce their vulnerability. These are summarized in Table 6, with most strategies focusing on diversifying income-generating activities in their communities, diversifying fishing activities and marine resources they can harvest, as well as diversification of their skills and capacities so that they could look for alternative employment when fishing is not profitable. Fishers believe that a review of the line fisheries and recreational fisheries sector and associated post-harvest activities is needed in order to assist them cope with stressors and adapt to change.

**Table 6**

**Summary of adaptation strategies and needs as identified by Henties Bay fishers**

| ***What strategies are working / could work?*** | ***What support do you need?*** | ***Support from whom?*** |
|---|---|---|
| 1) Organize local fishers (local and national) | Review of permit and permit conditions | Ministry of Fisheries |
| 2) Support Hanganeni | National support | All levels of government: national and local council |
| 3) Gear (boat, transport, bicycle, clothing, torches) | Need technical, HR support, e.g. UNAM<br>Ice-production machine | All interested |
| 4) Other local jobs: beach clean-ups, car wash, fish cleaning for tourists | Regular training workshops | Government's relevant ministries<br>UNAM |
| 5) Training and skills development | General to build skills for other livelihoods | All interested<br>Relevant government ministries<br>UNAM |
| 6) Fish consumption programme (to subsidize bad days) | Processing for packaging | |
| 7) Use other marine resources | Recognition from government and collaboration | Relevant government ministries |
| 8) Accessing new areas (including the protected areas) | Need point of sale/market, permit to sell and allowed to sell in Hanganeni<br>Need to be able to access these protected areas | |
| 9) Fish farm to grow of small fish for bait | Fish farm | |
| 10) Health support and infrastructure | Casting training and occasional back and neck therapy | Government and health institutions |

As an adaptive strategy, Henties Bay fishers felt that they would be better off if they were better organized, either locally in Henties Bay, or nationally by including fishers of other towns. For this to happen, they requested a review of fishing permits and permit conditions. This support was requested from the Ministry of Fisheries and Marine Resources.

Ongoing support for Hanganeni was identified as an adaptive strategy. This support was mainly in the form of buying their fish, and providing financial support. This support was requested from national government as well as local councils.

Fishers felt their vulnerability would be reduced if they could obtain support to improve their catch efficiency. They believe this can come in the form of gear, such as provision of transport to conduct fishing farther away, a boat to fish beyond the shelf break, bicycles to fish farther away, and clothes (warm or protective) to allow them to fish under various conditions. They believe the coastal environment has become colder, the sea rougher (strong winds and high tides/waves), and this has posed a health risk and led to drowning.

Fishers identified human resource development and capacity building as an important strategy to enhance knowledge generally and build skills that may be useful for alternative livelihoods. Institutions of higher learning, especially the University of Namibia, were identified as important in this regard. This support will help them find other jobs. Jobs such as beach clean-ups, fish cleaning (so that they can clean fish for tourists) and car washing were mentioned as alternative jobs that they could do.

Permission to utilize other marine resources was identified as a further adaptation strategy. Such permission would make it possible for the fishers to develop other products for income generation when line fishing for the current species is poor. They also requested information from the Ministry of Fisheries and Marine Resources regarding potential marine resources that they could utilize.

Fishers that operate independently proposed that a proper point of sale or a well-organized market be established for them. This would improve sales. They also wish to sell their fish to HAFA, though not on the current commission arrangements. The ministries and other interested institutions or individuals were identified to offer this support.

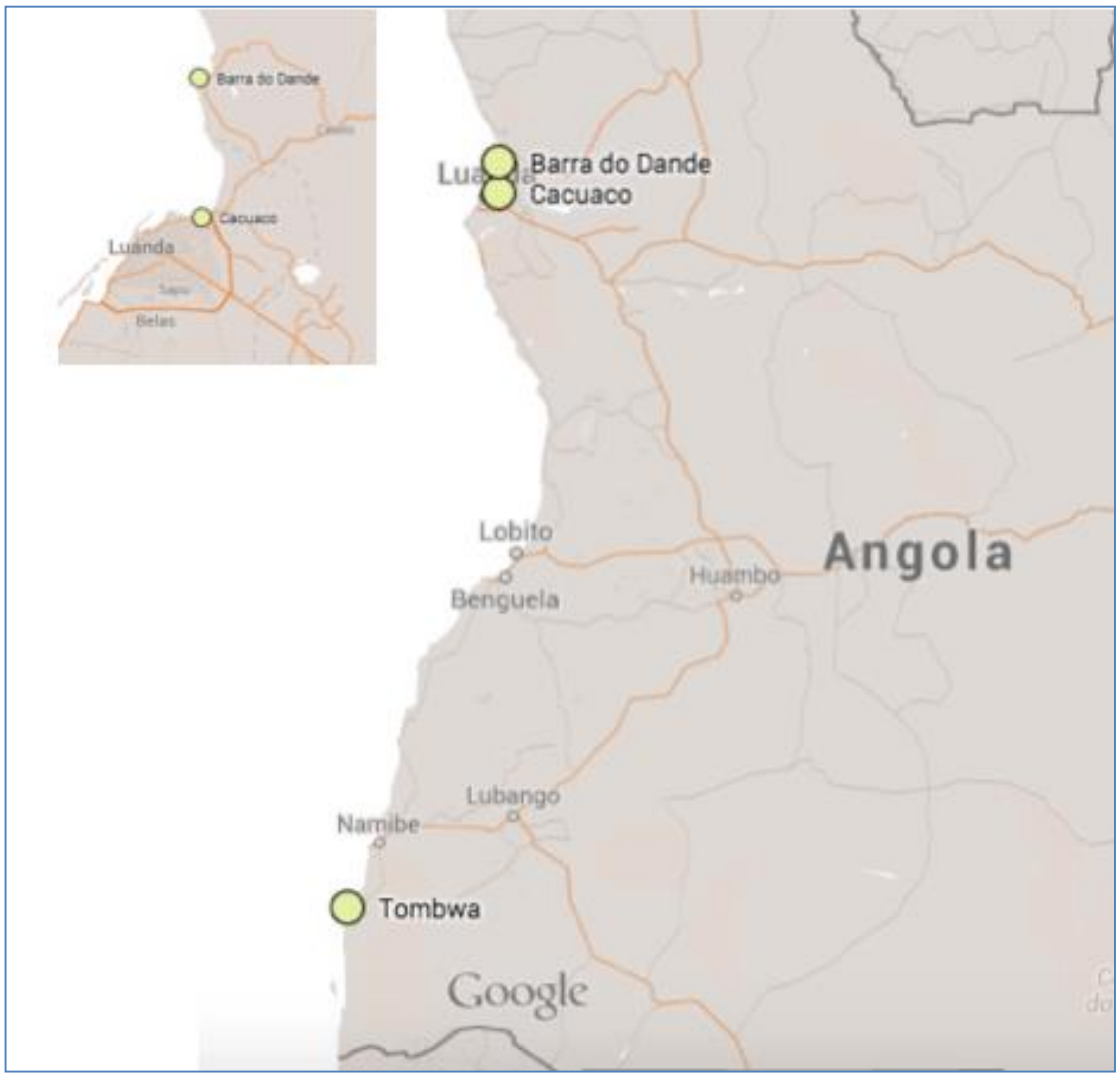
Owing to the increased number of "bad" catch days, which fishers perceive to be due to reduced fish stocks, fishers wanted permission to fish in protected areas such as Toskanini, north of Henties Bay, and at Sandwich Harbour in Walvis Bay. These areas are regarded as hotspots and they believed they could make good catches there. They want the Ministry of Fisheries and Marine Resources to review this restriction.

### 5.3 Angola

Three case studies were selected in Angola: Tombwa in the south; Cacuaco within the broader Luanda metropole; and Barra do Dande farther north (Figure 20).

**Figure 20**

**Angola case studies**




### *5.3.1 Barra do Dande*

***Overview and livelihood activities***

Barra do Dande is located on the coast about 85 km north of Luanda in Bengo Province. This is an old fishing settlement, and most inhabitants have been involved in fishing and farming for decades. As with most coastal settlements, historically local fishers were employed as crew on Portuguese-owned boats but engaged in fishing from canoes and small boats without engines for household consumption and sale. During the civil war years, the local community continued to engage in fishing and farming. At the end of the civil war, there was an influx of people to Barra Do Dande and other coastal towns seeking livelihoods, safety and work opportunities. There was also an increase in the number of people who came to Barra do Dande from the interior to buy fish for sale inland.

Fishing and related activities are a key livelihood strategy for many local people, and although subsistence farming was an important contributor to livelihoods in the past; in more recent times, lack of land for agriculture has curtailed this livelihood activity. Both men and women own boats and employ crew to catch fish. According to official figures, 564 fishers (men) are engaged in harvesting fish from boats (canoes, chatas and catrongas) while the women are involved in post-harvest activities, including buying fish from the boats when they come into

shore, cleaning and processing fish, as well as the sale of fresh, salted and cooked fish. The total number of women involved in post-harvest activities is not known. There is a large fish market alongside the main road to the north of the town, which sells salted dried fish and provides a livelihood for several women. Aside from the fishing sector and limited subsistence farming, there are few other livelihood activities. There are a few local restaurants, which are run by local inhabitants and are popular especially at weekends when people from Luanda visit the area.

According to IPA data, there are about 600 fishers involved in fishing as a main livelihood activity while many more are indirectly involved in the sector. There are two cooperatives in Barra do Dande and two groups of economic interest (GEIs, i.e. groups that work together before registering a cooperative). One of the cooperatives, Mukengueji, is registered in the government gazette and is functioning reasonably well. The cooperatives have been established to provide facilities and equipment to members at affordable prices. However, many fishers and fishworkers do not belong to a cooperative or GEI.

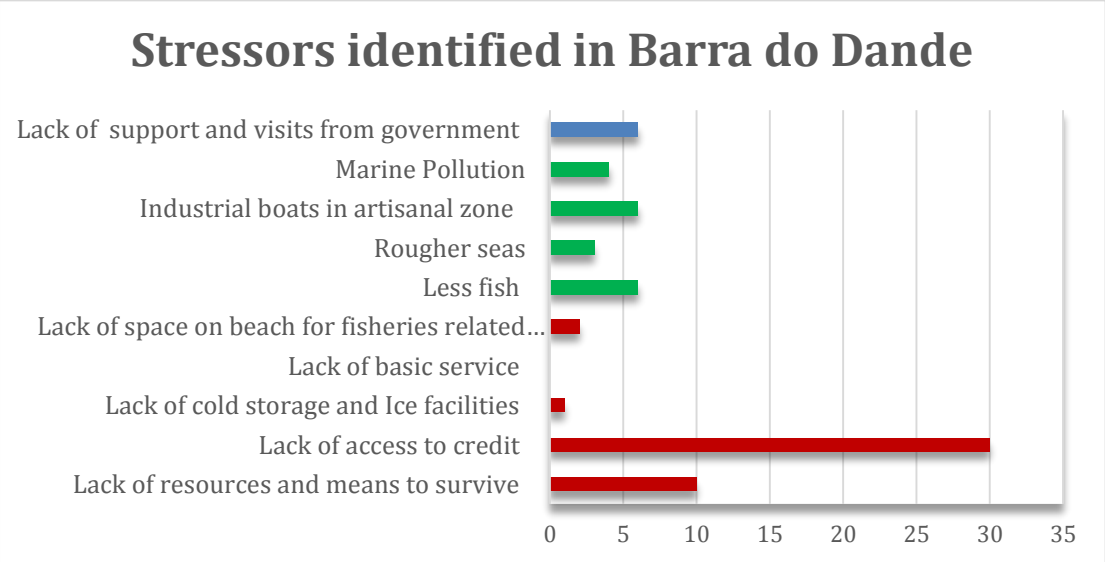
There were 16 participants at the workshop, 12 male and 4 female, although this number was reduced to 15 on the second day. The group comprised artisanal fishers, boat owners and fishworkers including women engaged in buying, cleaning, cooking, salting and selling fish as well as a restaurant owner. According to participants, fishing and fishing-related activities are the main livelihood activities for the fisher population in Barra do Dande. There are few other livelihood opportunities as there is limited land for agriculture in the town and for food gardens.

***Stressors and vulnerabilities***

Participants identified key stressors under the categories ecological, socio-economic and management/governance (Figure 21).

**Figure 21**

**Stressors as identified in Barra do Dande**




The key stressors to emerge during the workshop under the socio-economic category were lack of access to credit (30), and lack of resources and means to survive (10). Under the ecological category, less fish available (6) and presence of industrial boats in the artisanal fishing zone resulting in less fish available to fishers, were considered the main threats to livelihoods, although rougher conditions at sea, more wind, and larger waves were also identified as a threat to livelihoods (6). In the management/governance category, the key stressor was the lack of support from government (6). This included lack of communication with fishers, lack of visits by fisheries personnel, and no effort by government to learn about fishers' problems, and the

fact that government has not finalized the centre for fishers that is supposed to provide support to this sector.

The overwhelming concern for the workshop participants was lack of access to credit and lack of resources to survive. They expressed concern about the difficulty of gaining access to credit and were aggrieved that the banks offered credit to small farmers but not to fishers. Although the government did provide equipment from time to time, they complained about "imposed credit" that often arrived too late in the season, not when it was required, or was handed out (e.g. boats and engines) with no proper consultation and training. They specifically mentioned the poor quality of boats provided by government in 2008 (i.e. the Angolan government received 3 000 boats from China in 2008) and that these were distributed to cooperatives in an ad hoc manner, without training and ensuring that the boats were allocated to *bona fide* fishers. They were sceptical about government's intentions regarding allocation of boats and equipment, saying it often arrived at the time of elections and saw it as a way of gaining votes. Both men and women complained about the hardships experienced due to lack of access to credit. They also spoke about the lack of resources and facilities to support fishing activities, for example, the ice factory in Barra do Dande was not working.

The participants then focused on environmental changes. Although only six rated less fish available as a key stressor, in the discussion it became clear that those rating industrial boats in the artisanal fishing zone as a significant stressor were also concerned about the reduced catches of the artisanal fishers, which they attributed mainly to the industrial boats. They also highlighted the destructive nature of these boats that destroy the fish habitat and their nets, and chase the fish away. They indicated that they now needed to travel farther to find certain fish species, and that certain fish such as corvina (*Psuedotolithes* spp.), bagre (*Arius* spp.) and pungu (*Argyrosomus coronus*) were difficult to find. While one of the fishers mentioned that the winter season had lasted longer this past year, changes in sea temperature were not raised as a matter of concern. Instead, fishers spoke about rougher sea conditions, stronger currents and stronger winds, and that the stormy sea conditions were more prevalent than in the past. Although they raised concerns about use of small mesh size nets, and in particular the use of "banda banda" (beach seines), they indicated that this was not a big problem in their area.

With regard to governance, the main concern was lack of support and visits from government. The main concerns here included a lack of communication between government and fishers, lack of consultation with fishers on matters of relevance to their livelihoods, lack of coordination among representatives from IPA, the Provincial Fisheries Directorate and the Ministry. Fishers were particularly aggrieved that they had never met the Provincial Director of Fisheries and were seldom visited by fisheries government representatives.

***Historical review of key events and changes***

Fishers tended to refer to events and change in terms of key political events in history – post-independence (1975) and after the civil war (2002). After the declaration of independence in 1975, fishers spoke about the abundance of fish and that there was enough fish for everyone although facilities and infrastructure to support fishing and marketing of fish were weak. Government provided some (although limited) support in the form of boats and engines to fishing settlements during these post-independence years. Fishers mentioned that the government imported boats from the Russian Federation, and these were distributed to individuals and selected GEIs in about 1992. The end of the civil war in 2002 – "definite peace" – resulted in increased pressure on coastal resources as thousands of people moved to the coastal areas in search of safer living conditions, work opportunities and livelihoods. Some government institutions were established to support the fishers (FADEPA and fisheries training centres) after the civil war, but many of these are no longer functioning effectively and supporting fishers. However, the fishers reported that in the first few years of peace there was an abundance of fish and they did not need to travel far to find good catches. They also mentioned how in 2008, an election year, the government distributed boats (about 3 000 boats from China) to GEIs and cooperatives across the country. However, fishers were not properly

organized, there was no training, and the quality of the boats was very poor. They also mentioned several times how in the past 5–10 years the catches have declined and fishers have had to go farther out to find certain species.

While the fishers enjoy some legal protection with the promulgation of the "Lei dos Recursos Bioloicos Aquaticos" in 2004, which identified a 4 nm zone from the shore seawards for use by artisanal fishers and where industrial boats were prohibited, they stressed that this law was not being enforced. They also claimed that although there was a period when the minster had clamped down on industrial vessels in the 4 nm zone, since about 2008 there had been no effort by government and enforcement officials to monitor and fine the illegal activities of these vessels. They complained that the industrial vessels switch off their vessel monitoring systems and cannot be traced. Moreover, they are convinced that the industrial boat owners are bribing many of the enforcement officials.

Fishers did not identify any particular environmental event that had affected livelihoods but spoke rather about environmental changes that they have observed over the years and believe could be affecting their catches. In particular, the rougher sea conditions, which seem linked to stronger currents and stronger winds, are affecting the number of days they can go to sea. Most of them anchor in the river-mouth area and have to navigate through the mouth of the river. The rougher conditions means they cannot put out to sea, or when they can, they may not be able to reach the fishing grounds because of large waves.

***Impacts associated with environmental stressors and changes***

Participants were asked to focus on the environmental stressors and changes, and to identify impacts and implications of these events and changes for their livelihoods and lives. They were also asked to rate the impacts on a scale of high, medium and low.

**Less fish:** Fishers described how abundant the marine resources had been previously and how it was possible to make a living from a canoe or small boat without an engine. Now, there is less fish available, and fisher need to go farther out to sea and stay away for longer periods to find fish. This is costly as fishers require more fuel for fishing trips and the longer trips mean more "wear and tear" on the boats and engines, which also incurs additional costs. Reduced catches mean less income, and so fishers and fishworkers need to borrow money from boat owners or "big buyers", and this leads to indebtedness. However, some of boat owners (mainly women) highlighted how the impacts of less fish is also a major problem for them, as they are not able to pay their crew when catches are low, and this is leading to conflict between boat owners and fishers. Some fishers have sought alternative work although opportunities are very limited. The women again highlighted the need for access to credit to deal with the periods when fish catches were poor. Workshop participants rated this impact high. Participants blamed the presence of industrial vessels in the artisanal zone as the main reason for reduced catches. They also blamed the use of destructive gear – small-mesh nets –used by the artisanal fishers as a contributing factor to the decline in fish catches. They were very concerned about the destructive gear used by the industrial boats in this inshore zone (discussed below).

**Industrial vessels in the artisanal zone:** Also identified as a cause of reduced catches, the presence of industrial vessels in the artisanal fishing zone was identified as a major environmental stressor by the group. These boats come close inshore looking for high-quality fish. Impacts include destruction of habitat, unsustainable catches and concerns about bycatch, much of which fishers claim is discarded, and the practice of "high grading". This latter concern was confirmed by fishers that had worked previously on industrial vessels. Other impacts include destruction of artisanal fishing nets and boats, and even deaths at sea as a result of accidents. The fishers were aggrieved by government's lack of action to apprehend industrial vessels in their waters, and said the system of surveillance and enforcement was ineffective and corrupt, as they believed that boat owners were bribing many enforcement officials, and in cases where industrial boat owners were fined, they usually had the fine waived due to political connections and/or by paying off high ranking officials.

**Rough seas:** Fishers claimed that the sea conditions were rougher now than historically. They spoke about experiencing bigger waves and stronger currents and winds. This prevented them from going out to sea, which affected their income and ability to support their families. They also mentioned that the rougher sea conditions resulted in loss of equipment, boats and even life. A number of boats have been washed out to sea (from the beaches), and because they have no access to credit, replacement of nets and boats has not been possible, and some fishers have lost their livelihood. This impact was rated high. Fishers indicated that they were unsure about the causes of the changes in sea conditions, but said that from what they have heard it could possibly be linked to climate change – while others attributed the changes to "nature and a natural phenomenon".

**Lack of access to credit:** Although a lack of access to credit did not fall into the environmental stressor category, fishers wanted to discuss this issue as they said this was the greatest stressor they faced. They complained that there were no institutions that provided credit, while government credit was "imposed" and came at the wrong time with no training and support. Lack of access to credit means that if boats and equipment are lost at sea or damaged, people have to stop fishing. In the case of boat owners, they then need to rent a boat from someone else. This has impacts on both boat owners and crew who cannot earn an adequate income. This impact was rated as high.

***Coping mechanisms***

The workshop participants had little to offer with regard to coping mechanisms employed to deal with the stressors experienced as well as perceived environmental changes. With regard to **less fish** available, women indicated that they would resort to cooking and selling food, baking and selling cakes. Fishers and boat owners said they would sometimes obtain an advance from the "big buyers", but this was undesirable as the buyers charge high interest rates and then one could become indebted to them. They said they received very little support from government as mentioned above.

With regard to the presence of **industrial boats in the artisanal fishing zone,** fishers and fishworkers felt a sense of helplessness and did not know where to seek assistance. The industrial vessels cover up their registration numbers and if the artisanal boats some too close, "they turn on us". "Nothing can be done", "we submit complaints but there is no response from government", "we seldom receive compensation". Fishers stated that there is limited support from government and few have received compensation even though the law requires compensation. Moreover, the administrative procedures for applying for compensation are complex and onerous. In regard to **rougher sea conditions,** participants said that "there is nothing we can do about the rough seas, we just wait for the weather to improve".

With respect to **lack of access to credit,** some workshop participants indicated that they would take a loan from the "big buyers" (see above). There was little support from government to cope with this problem, and they did not recognize some of government's interventions as they regarded these as top-down, imposed and not responsive to their local needs.

***Adaptation strategies and needs***

The workshop participants identified a number of strategies that they believed could enhance their vulnerable situation. These were listed and discussed in the final session (Table 7).

**Table 7**

**Adaptation strategies and needs for Barra do Dande**

| ***Environmental problem*** | ***What adaptation strategies are working / could work?*** | ***What support do you need?*** | ***Support from whom?*** |
|---|---|---|---|
| Less fish | Decrease number of industrial vessels (programme proposed but never implemented) | - Impose limits on number of industrial vessels<br>- Better enforcement | - Govt. (Fisheries Ministry and IPA)<br>- Enforcement officials |
| | Fishers and fishworkers must be involved in cooperatives | Assistance with local organization | - Govt. – IPA and new training centres<br>- cooperative leaders and members |
| Rougher seas | Access to Internet for weather forecast for fishers Those with access to Internet can inform the rest of the community | - Need early warning (EW) system.<br>- Need radios for ship-to-shore communication<br>- Need local centre for fishers with computer, access to Internet | - Govt. to work with fishers to develop EW system<br>- Govt. to provide support to set up local fishers centre |
| | Skills to access Internet and understand weather forecasts | Need for skills training to access Internet, look at forecasts etc.<br>School for training fishers needed | - Govt. (IPA) to lead this.<br>- Assistance from universities also required |
| | Warning system if storms are imminent | Govt. to provide warning system on beaches to alert fishers to bad weather | Govt. |
| | Need for onboard radio to communicate with shore | Need radios and stations (govt. already obtaining radios, GPS and weather forecast) | Govt. to assist and provide equipment |
| | Fishers must become organized | - Fishers in cooperatives to encourage others to join | Local fisher cooperative leaders, other cooperative members and IPA |

| *Environmental problem* | *What adaptation strategies are working / could work?* | *What support do you need?* | *Support from whom?* |
|---|---|---|---|
| | | - Require incentives from govt. | |
| Broader fisheries support | Fishers need to be better organized and encouraged to join cooperatives | - Those in cooperatives to encourage others to join<br>- Govt. to provide appropriate and timely support (not imposed credit) | Govt. and banks |

Although workshop participants identified becoming organized as an important strategy under each stressor, they were less clear about how this could be achieved. There were comments from those in cooperatives that there were benefits to belonging to such community organizations and that they had a responsibility to encourage other fishers to join. However, they felt that government should provide some kind of incentive to encourage people to join cooperatives. They discussed the fact that by being more organized in a recognized group such as a GEI or a cooperative they would stand a better chance of receiving credit. Participants also discussed the importance of an early warning system that would alert fishers to storms and bad weather conditions. They also need a system of communication from ship to shore, and training on using such equipment. Already, those that have access to the Internet (very few) let others know when bad weather are conditions expected. However, proper training on use of the Internet and other safety equipment is urgently required, and government has a responsibility to provide such training or at least facilitate access to such training. Establishing a fisher centre in the community with a computer and access to the Internet would be important, as it would be a meeting place and information hub for fishers. There was no discussion about how such a fisher centre would link to the existing cooperatives. Fishers clearly look to government and IPA in particular to support them in adapting to stressors and perceived environmental variability and climate change.

### *5.3.2 Cacuaco*

#### *Overview of the study area*

Cacuaco is located on the coast, about 20 km north of Luanda in Luanda Province. This is an old fishing settlement, and most inhabitants rely on fishing for food and livelihoods. Local inhabitants have been involved in fishing in Cacuaco since the colonial era. Soon after independence, during the period 1975–78, a fishers association was established in Cacuaco as, the country's president at the time encouraged people to join together and form associations. During the civil war years, there was an influx of people into the main coastal cities including Luanda and surrounding coastal towns, as these areas were considered to be safer than rural areas. After the civil war, the population increased significantly in the Luanda area, and fishing became a key livelihood strategy for many local people. About 980 men are involved in harvesting marine resources using canoes, chatas and catrongas, and about 151 women are engaged in post-harvest activities. There are also a number of women who own boats and employ crew. Little is known about the post-harvest activities but local women and young girls engage in various activities, including buying fish from the boats when they come into shore, cleaning and processing fish, as well as the sale of fresh, salted and cooked fish.

According to recent census data, Cacuaco has a population of 26 000 people, with about 1 500 involved in fishing as the main livelihood activity. There are three functioning cooperatives in Cucuaco, two at Barra do Bengo and one at Kilamba-kiaxi. There are also a few GEIs. The cooperatives and GEIs have been established to help organize fishers and provide facilities and equipment to members at affordable prices. However, membership of these local organizations is relatively low, given the large number of fishers and fishworkers engaged in the fishing sector.

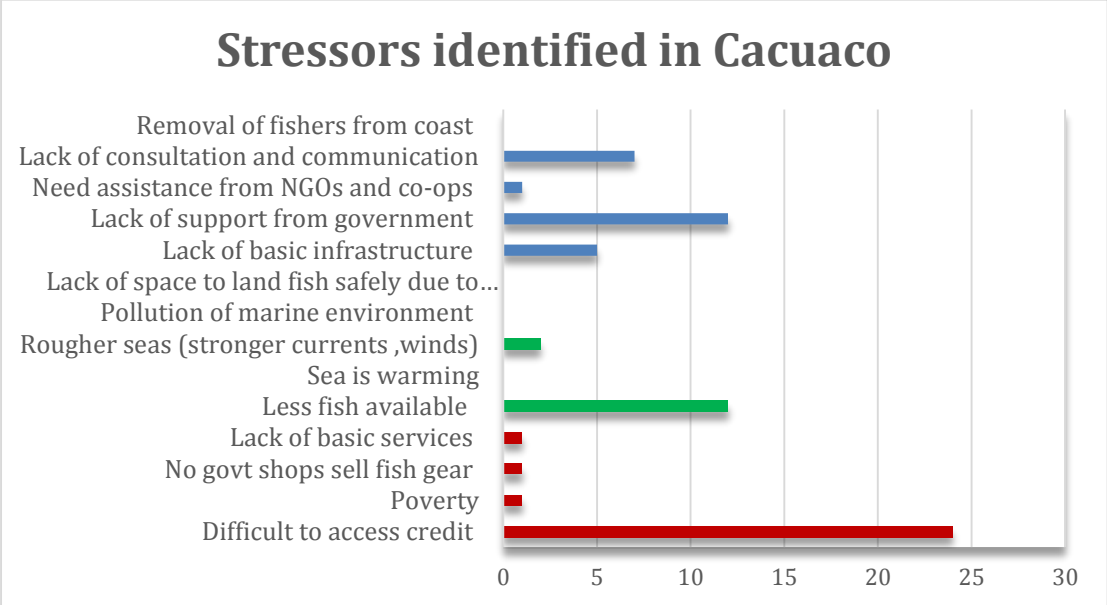
There were 17 participants at the workshop, 12 male and 5 female participants, comprising artisanal fishers, boat owners and fishworkers, including women engaged in buying, cleaning, cooking, salting and selling fish. On the first day of the workshop, there was some concern that there were too few fishers present (mostly boat owners and fishworkers), and it was agreed that the cooperative leader would endeavour to invite more fishers and fishworkers to attend the workshop on the second day. According to participants, fishing and post-harvest activities are the main livelihood activities in Cacuaco. There are few other livelihood opportunities as there is limited land for agriculture in the town and for food gardens.

***Stressors and vulnerabilities***

Participants identified key stressors under the categories ecological, socio-economic and management/governance (Figure 22).

**Figure 22**

**Stressors identified in Cacuaco**




*Notes:* ecological = green; socio-economic = red; governance = blue

The three key stressors to emerge during the workshop process were: (i) difficult to access credit (24) under the socio-economic category; (ii) less fish available (12) under the ecological category; and (iii) lack of support from government (12) under the management/governance category. Other stressors that also ranked high include lack of consultation by government with fishing communities (7) and lack of basic infrastructure (5). This latter issue was further reinforced by a group of women that arrived early on day two of the workshop to share their concerns. In particular, the lack of space and shelter (e.g. canvas) on the beach to be able to clean, salt and prepare fish was a problem, especially when it rained. Other stressors identified by participants under the ecological category were that the sea is warmer, rougher and there are more storms, there are stronger currents and there is more wind. Pollution of the marine environment was also highlighted as a problem. Under the socio-economic category, lack of

access to credit was clearly the over-riding concern, although poverty among fishers and fisher families and the fact that there were no government shops that sold equipment were also listed. Under the management/governance category, fishers expressed concern at the absence of NGOs and limited support provided by the cooperatives, and that fishers had been removed from coastal land and they no longer had adequate space to conduct their post-harvest activities. This was exacerbated due to increase in rough seas, which damaged coastal infrastructure and even washed their boats and nets out to sea. Both men and women ranked lack of access to credit as the most pressing problem.

In the discussion on key stressors, a key focus was on the decline in catches that fishers have experienced in the past 10–20 years. Fishers also complained that now they need to go much farther out to sea to catch fish – up to 1 000 km farther away. They also spoke about the disappearance of or difficulty in finding certain species, such as bagre, cachucho, corvina, punga, lagosta, peixe burro, peixe serra, savelha, taco, faneca, ferreira and pargo (see Table 10 for species names). They attributed the decline in fish catches to "climate change" and said that the sea was warmer than previously, and this in their view was an indicator of climate change. They also attributed reduced catches to the presence of the industrial vessels in the artisanal fishing zone (4 nm from the shore reserved for artisanal sector in terms of the law) and the nets they use, which "destroy everything". They also mentioned the excessive growth of mangroves that are encroaching on areas where fish spawn with the result that fish may move and spawn elsewhere. They were also concerned about the rubbish being dumped at sea, as it pollutes the waters and may affect the fish. Participants expressed concern at the increase in numbers of people relying on fishing as a main source of livelihood and felt that there was huge pressure on the fisheries in the Luanda Bay. Some boats are used in the morning by one fisher and then by another in the afternoon. Some of the practices of the artisanal fishers, such as use of small mesh size nets and in particular the use of "banda banda" (beach seines), which is illegal, were identified as problems that could be affecting fish abundance. The fishers complained about the lack of enforcement of fishing regulations, and that the enforcement officials were in the pocket of the industry. Moreover, the observer programme (beach monitors) had largely collapsed, and collection of catch data was ad hoc and there was no functioning data collection and analysis system. While some acknowledged the need for better law enforcement, they also indicated that they prefer to harvest the small sardines, as these sell well even though they understand these practices affect resource sustainability.

***Historical review of key events and changes***

**Less fish available**: Fishers spoke of fish being abundant in the 1960s and 1970s. In the colonial period, fishers did not own boats and either fished close to shore using canoes or crewed on boats owned by the Portuguese. There were fishmeal factories, which employed a lot of local people, but these closed down towards the end of the colonial era. During this period, fish were abundant and all species could be found. The 20-year civil war that followed independence led to an influx of people into the main coastal towns, including Luanda and Cacuaco. Fishers also mentioned that fishers from Kwanze Sul could not fish from their shore, as there were poor catches in that province, and moved north to Luanda and Cacuaco. Limited work opportunities meant that people relied increasingly on fishing for food and livelihoods. In addition, Angola's entry into the world market meant that there was greater pressure on marine resources from foreign fleets and industrial vessels. Moreover, from the 1990s onwards, government encouraged the use of fish for food, placing greater pressure on these resources. There were very few fishing regulations and rules. After the civil war, the number of artisanal fishers using the waters off Cacuaco increased, as did that of industrial fishing boats. The industrial boats encroached into the artisanal fishing zone and, in addition to fishing in these waters illegally, destroyed nets and boats and posed a safety risk to the small-scale fishers.

**Rougher seas:** Fishers spoke of high seas being experienced in previous years. They indicated that from May to August, it is not unusual to have high seas and during some years the seas are "higher" than others. They made reference to the big seas of 2007, when heavy rains destroyed the fishers' school and a bridge. Some indicated that their grandparents had spoken about big

seas in some years. This year there have been some very big waves that have destroyed some canoes and eroded parts of the beach. However, some fishers were convinced that the seas were becoming rougher, and they attributed this to climate change.

**Difficulty to access credit:** While FADEPA was set up to provide credit to fishes to enable them to purchase boats, engines and equipment (e.g. nets), fishers were not able to access credit when they required it. Government does distribute boats and equipment from time to time, but this is not systematic and logical and is distributed according to government criteria with little consultation with communities. It is often provided at the wrong time, in the middle of or after the main fishing season. This has been and remains a key stressor for fishers as they fall into debt.

**Lack of support from government:** After independence (1975), government focused on supporting artisanal fishers through providing support to establish fisher associations and cooperatives, and even distributed boats and equipment. The support to the artisanal sector was not sustained. In 1993, Soviet industrial boats arrived and these had an impact on the artisanal sector. In 2008, 3 000 boats ordered by government from China arrived in Angola and were distributed to the cooperatives along the coast. However, these boats were of poor quality, fishers were not trained to operate them, and they were distributed in a rather arbitrary manner, with many stating that the handing out of boats was linked to securing votes for the upcoming elections. Some of the boats ended up with people that did not have a history of fishing, and this process created conflict in communities.

While government has legislation to protect and support the artisanal sector, in practice there is very little government support to this sector. Fishers felt that government had failed to provide essential services and infrastructure for fishing communities, did not facilitate access to credit, and seldom visited communities to gain first-hand information about their problems.

***Impacts associated with environmental stressors and changes***

Participants were asked to focus on the environmental stressors and changes/events, and identify impacts and implications of the changes to their livelihoods and lives. They were also asked to rate (on a scale of high, medium and low) how serious these stressors/events had been in terms of their livelihoods.

The workshop participants decided to focus on four key environmental stressors: (i) less fish; (ii) sea warming; (iii) strong currents and winds; and (iv) marine pollution.

**Less fish:** the reduction in fish catches is contributing to increased levels of poverty in the community as well as loss of motivation among fishers. Local fishers and fishworkers are struggling to pay back loans and becoming indebted to boat owners and buyers. Women in particular are struggling, as there is not enough fish to buy, and they have had to resort to cooking and selling food. The impacts of a reduction in fish catches permeate the entire local economy. This impact was rated high. Fishers blamed the reduced catches on the presence of the industrial boats in the artisanal fishing zones, use of banda banda nets, and fishers from elsewhere moving to Cacuaco or fishing in their waters. They also attributed the reduced catches to climate change, but were uncertain about the causal link. They noted that the sea is warming and the currents and winds seem to be stronger. However, there was no sense of over what period of time this change had been observed.

**Sea warming:** The second environmental stressor/change noted was that the sea is becoming warmer. Fishers spoke of the water temperatures being higher than previously and that fish die at sea whereas before they lasted longer. Now, it is necessary to take ice to sea. (This could also be linked to the fact that fishers now have to go farther out to sea to find the fish). They rated this impact high and attributed the warmer seawater to global warming. Linked to the above is their perception that **currents and winds are becoming stronger**. Sometimes the winds are too strong, and fishers cannot go to sea or reach the fishing grounds. This is happening more frequently now than in the past. If the fishers go out and do not catch fish, they lose money, as they have to pay for petrol. Sometimes, the sea is so rough that fishers risk losing their nets.

The fishers also rated this impact high. They attributed stronger currents and winds to increased temperatures, which they attributed to global temperature increases.

**Marine pollution:** Fishers were concerned about the increase in marine pollution, which they said affected water quality and the fish (they move away) and also had an impact on their health. Discarded and lost nets in the ocean also posed a danger to fish and other mammals. They claimed that the pollution was caused by the diesel, oil and other chemicals on board the industrial boats, and the leaks and spills that occurred. They were also concerned about the impact of oil, lead, rust and other metals from abandoned ships along the coast. This impact was rated medium.

***Coping mechanisms***

Workshop participants were not very forthcoming in this exercise, saying that they had always been poor and they had learned to find ways of coping. However, when pressed they did identify a number of coping mechanisms, although most of these were considered unsatisfactory.

**Less fish**: Less fish means that fishers have had to look for other jobs, which is not easy as there are very limited livelihoods opportunities outside the fishing sector. Even finding casual work is difficult. Previously, fishers had backyard gardens, but now the town has become crowded and few people have space for gardens. Some fishworkers set up a stall or kitchen and sell cooked food. Basically, they have to survive on what they have. Sometimes, they go out to sea in rowboats (to save fuel costs) to try and harvest fish. The participants indicated that they were used to being poor. They wanted to develop mariculture but did not have the expertise or equipment. The other environmental changes identified above – sea warming and stronger currents – also resulted in people catching less fish and so the coping mechanisms listed above were similar, although fishers did say that they would share boats to help each other (the boat would go out twice a day).

**Marine pollution:** There are some local initiatives funded by local or national government (although participants were not sure about this) and some local companies to clean up the beaches and marine environment. This provides some ad hoc employment for unemployed youth, although very limited. The fishers do not benefit from these opportunities. However, they noted that these initiatives were sporadic and there was no coordination among government and companies funding the programme. Basically, fishers have not been proactive in terms of their concerns about marine pollution, and they expect government to take the lead on this.

***Adaptation strategies***

Throughout the workshop, participants had identified a number of strategies that they believed could improve their vulnerable situation (Table 8).

**Table 8**

**Adaptation strategies and needs for Cacuaco**

| ***What strategies are working / could work?*** | ***What support do you need?*** | ***Support from whom?*** |
|---|---|---|
| Better organization among fishers required | Fishers need to be made aware of the benefits of joining a fisher organization/cooperative. Incentives are required to convince fishers to join cooperatives | IPA and Ministry of Fisheries provide their support to cooperatives |

| ***What strategies are working / could work?*** | ***What support do you need?*** | ***Support from whom?*** |
|---|---|---|
| Strengthen the cooperative structure | Cooperative leaders and members to encourage fishers to join | IPA, Ministry of Fisheries |
| Convert to bigger boats – semi industrial | Facilitate access to credit | Banks and FADEPA, IPA and the Ministry of Fisheries |
| Investigate development of aquaculture and mariculture | Research to inform development of initiatives | Govt. needs to initiate with assistance from research institutions |
| Improve compliance with regulations regarding banda banda (beach seine) and harvesting undersized sardinha | Improved policies and regulations to prevent destructive fishing practices<br>Better enforcement of the rules<br>Govt. must enforce rules<br>Place inspectors on foreign vessels as required by law | Ministry of Fisheries, IPA, enforcement officials |
| Awareness raising and capacity development | Community/fishers need greater awareness about destructive nature of banda banda nets | IPA, new fisheries centres, Ministry of Fisheries and tertiary institutions |
| Improve communication with government | Need skills training to enable better communication with government | Government and tertiary institutions |

Fishers supported the suggestion that becoming more organized and joining a fisher association or cooperative would provide a form of support, especially during difficult times. In particular, they felt that greater attention needed to be given to strengthening the cooperatives in the area and encouraging all fishers to become members, as these structures could provide support in terms of access to equipment and information. However, incentives would be required in order to convince fishers to join. This would require involvement of the local cooperatives leaders and members to encourage other fishers to join. They would also require assistance from IPA and the Ministry of Fisheries to raise awareness about the procedures for forming such local GEIs and cooperatives and providing incentives for people to join. Workshop participants also highlighted the need for awareness raising, training and capacity development. They mentioned the need to raise awareness about the destructive nature of banda banda and to explore sustainable harvesting practices. They identified the importance of research and information to explore the potential for developing aquaculture and mariculture as a means to support livelihoods. It was suggested that tertiary institutions should play a role here. Given their reduced catches and need to go farther out to sea, fishers identified access to bigger boats

(catrongas) as a way forward. Government would need to facilitate access to credit, and encourage banks and FADEPA to offer loans to fishers to acquire these boats.

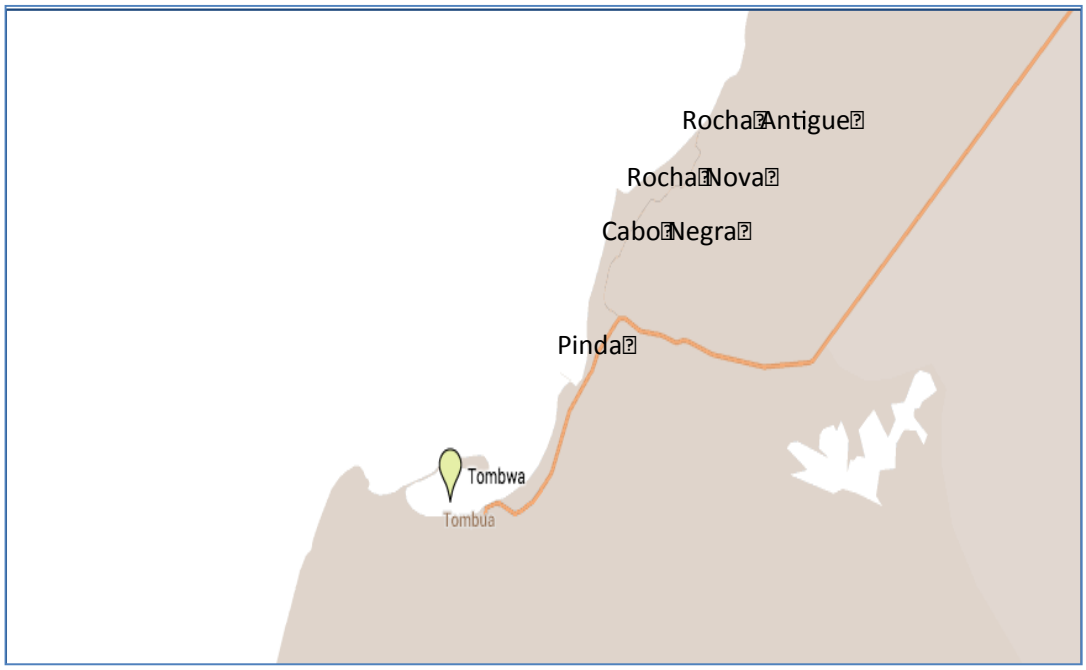
### *5.3.3 Tombwa*

***Overview and livelihood activities***

Tombwa is a fishing town situated in southern Angola, in the Province of Namibe. It is the southernmost town before the Iona National Park and Namibian border. The town is located on the inside of a natural lagoon (Figure 23).

**Figure 23**

**Relative location of Tombwa inside the lagoon and other smaller fishing settlements**




Census records for Tombwa were not available. However, the 2014 census estimated 470 000 people living in the Province of Namibe, with the great majority living in and around Namibe town itself. Discussions with IPA field staff suggested a population for Tombwa of fewer than 80 000.

This fishing settlement only developed into a larger town in the 1950s–1970s with the development of a flourishing pelagic fishing industry. Many processing factories were set up along the town's coastline, as the natural lagoon provided for an ideal harbour and landing site for the semi-industrial purse seine fleet. The semi-industrial industry attracted labour from neighbouring provinces that settled in Tombwa. Nowadays, most factories are abandoned, with many fishers and workers once employed by the pelagic industry having turned to artisanal fisheries as a primary source of livelihood.

The current artisanal fishery comprises several different fisheries (Table 9), using different gear types, with small-motorized vessels called "chatas" venturing up to 5–10 nm offshore and along the coast. A chata usually carries 3–5 people depending on the weather conditions. The fishing usually consists of day and/or night trips, but generally these do not last longer than 10–15 hours.

**Table 9**

**Different fisheries and gear used in Tombwa, according to recognized sector**

| Sector | Semi-industrial fishery | Artisanal fishery | Artisanal fishery | Artisanal fishery | Subsistence fishery |
|---|---|---|---|---|---|
| Type of vessels | Purse seine deckboats targeting small pelagics (only 5–10 left) | Small wooden vessels (chatas) with or without outboard engines (40 hp) | Smaller polystyrene rafts (bimbas) | Shore-based | Shore-based handline |
| Gear used | Purse seine | Handline (pesca ligna)<br>Gillnet (emelhar)<br>Traps (gaioles) | Handline | Beach seine, with one vessel to take net out (banda or arujta no praia) | Handline |

The workshop was organized by the Namibe-based IPA official in collaboration with the local municipal officers, and held in a community centre in Tombwa. Participants had been identified by the local coordinating team and consisted of 22 fishworkers. Three boat owners (chatas) were present, with one of them from the neighbouring smaller village Rocha (Figure 23). Five women fishworkers participated in the workshop, all identifying themselves as artisanal fisherwomen even though they mainly (80 percent) processed catch from the semi-industrial pelagic fishery. Lastly, 14 young fishers who operate on chatas were also present. Most participants were young (below 35 years of age).

As per Table 9, it is important to note that no subsistence fishers were present, nor beach-seine fishers, raft fishers or local buyers from the artisanal fishery (usually women from the community working individually).

As none of the participants had ever attended workshops of this nature, it was necessary to adapt the methodology. Group work did not work as well as in the other case studies, and participants felt more at ease in a facilitated plenary setting. In connection, some exercises were perhaps too abstract for this group (e.g. ranking). Moreover, with the majority of participants younger than 35, it was harder to run the timeline exercise. In discussions during breaks, the team decided to adapt the methodology by shortening the RVA workshop but increasing the fieldwork component with on-site field interviews at the landing sites and markets. During the field visits, individual and group interviews were held with older members of the community as well as with fishworkers from "metiers", which were not represented at the workshop.

The village mapping exercise revealed the various fishing gear types used in the artisanal fishery, from fishers, to boat owners and women processors. During this exercise, the fishers also generated lists of main species caught in summer and winter (Table 10), as these differences directly affect their livelihood. Catch from the artisanal fishery is mostly salted and dried or sold fresh to traders, who transport the fish to larger towns such as Luanda. The women mentioned that the semi-industrial catch is either processed in a privately owned factory or sold through the women cooperatives that have a dedicated centre for salting and drying (Table 11). Overall, all participants noted that there were no other livelihood or job opportunities available

as Tombwa is located in a very arid area. Some fishers mentioned subsistence agriculture in household gardens or river beds.

**Table 10**

**Perceived seasonal changes in species composition of current artisanal catches, Tombwa**

| Winter | Summer |
|---|---|
| **Corvina**, Geelbek croaker (*Atractoscion* spp.) | **Corvina**, Geelbek croaker (*Atractoscion* spp.) |
| **Cachuchu**, Large-eye dentex (*Dentex macropthalmus*) | **Mero**, Yellowbelly rockcod (*Epinephalus marginatum*) |
| **Carapau**, Horse mackerel (*Trachurus capensis/tracae*) | **Chern**, Dogtooth garoupa (*Epinephalus caninus*) |
| **Marequita**, Blacktail seabream (*Diplodus sargus* spp.) | **Pargo** (*Pagrus auriga*/*africanus*/ *caeruleostictus, Dentex gibbosus*) |
| **Lula**, Good Hope squid (*Loligo reynaudii*) | **Pescada**, Hake (*Mercluccius* spp.) |
| **Liro** (?) | **Enshova**, Shad (*Pomatomus saltatrix*) |
| | **Atum (quimbumbu)**, Yellowfin tuna (*Thunnus albacares*) |
| | **Dourado**, Dorado (*Coruphaena equiselios*) |
| | **Tubarão**, Shark |
| | **Serrajão**, Atlantic bonito (*Sarda sarda*) |
| | **Judeu**, Frigate mackerel (*Auxis thazard*) |
| | **Tico tico**, Red pandora (*Pagellus belloti*) |
| | **Pungu** West coast dusky kob (*Argyrosomus coronus*) |
| | **Camucina** (?) |
| | **Palembeta**, Leerfish (*Lichia amia*) |
| | **Peixe burro**, Dusky rubberlips (*Plectorhinchus mediterraneus*) |
| | **Sardinha** |

*Note*: As identified by the workshop participants.

Summer is regarded as the main fishing season (Table 10). Some fishers mentioned that mero and chern also appear in the cold season, but those are not targeted specifically, and one of the groups suggested that pargo was primarily a winter species. In winter, fishers generally target cachuchu. This is different from the other species because the trace configurations are different (up to 50 number-10 hooks per line). Moreover, they fish in deeper water (200 m). In summer, fishers generally target multiple species with few (up to 4) larger hooks in shallower waters (40–80 m). If the catch is low, fishers will switch to the cachuchu fishery (i.e. add hooks and go deeper). Cachuchu and liro are caught at the same depth (about 200 m).

**Table 11**

**Species processed by the members of women's cooperatives present at the workshop**

| Winter | Summer |
|---|---|
| Runcador, *Pomadasys peroteti/jubelini* (bimbas) | Carapau, *Trachurus trecae*/ (semi-industrial, chatas, banda banda) |
| Enshova, *Pomatomus saltatrix* (bimbas) | Cavala, *Scomber japonicus* (semi-industrial, chatas, banda banda) |
| Mariequita, *Diplodus sargus* spp. (bimbas) | Sardinella, *Sardinella aurita/maderensis* (semi-industrial) |

In terms of chata operations, the participants mentioned that each boat has an owner, who may or may not also own gillnets and traps. The owner does not fish and normally has another land-based occupation. The boat owner is responsible for the maintenance and repair of the boat and engine, and supplies engine oil. The fishers are responsible for buying the fishing gear, bait and fuel. Chatas normally have a crew of 3–6. In Pinda, the chatas normally do not have engines, and the crew size is about four. In Tombwa, the boats mostly have engines and a crew of about five. Bait for a fishing event normally comprises a crate of sardinella, which costs KW3 000 (22,2 USD). They obtain this from the semi-industrial sector. Fuel depends on the distance travelled, but fishers normally spend about KW200 (1,4 USD) each on fuel. The cost of fish varies per species, but the price for a crate of cachuchu is KW3 500 (26 USD). About one-third of the catch is given to the boat owner while the remaining two-thirds is divided among the crew. Local community women buy the fish from these fishers. Often, wives have preferential access to their husband's catch. They sell it on to local or regional traders in what appears to be an intricate network of local benefit-sharing arrangements. Dried fish sells for similar prices as fresh fish, even though the process of salting and drying takes up to eight days and is considered labour-intensive.

Out-of-town traders spend several days in Tombwa. They fill their freezer trucks with large specimens (normally garoupa, chern, pungu, pargo). The catch is then taken to Luanda for sale. Pungu is normally bought from the women fish sellers for about KW700/kg (5,1 USD/kg). They spend about KW100/kg (0,74 USD/kg) for the transport and sell the fish for KW1 000/kg (7,4 USD/kg), which gives them a profit of about KW200/ kg (1,4 USD/kg). The one truck observed during the field visits held 1.5 tonnes and the other 3.5 tonnes of fish. This would give them a profit of KW300 000 (2200 USD) and KW700 000 (5185 USD) for each of the two trucks, respectively. The traders generally go to Tombwa in the summer months and then go north of Luanda during winter. They also mentioned that they buy pungu farther north (Benguela) in the winter months.

***Stressors and vulnerabilities***

Participants identified a range of stressors under the categories ecological, socio-economic and management/governance (Table 12). Within the ecological category, lower fish abundance and an increase in the number of seals were highlighted as the main challenges. Participants argued that the seals eat the fishers' catch, especially when the fishers are deploying gillnets (see below). Although the fishers have been using gillnets since at least the 1990s, only more recently have the seals become a problem and prevented many from using the nets.

Participants struggled to differentiate between the socio-economic and governance challenges, but identified lack of finance and gear for all aspects of fishing as their major challenge. They mentioned that the price for fish had remained the same over the last ten years but that the fuel price had increased. Several fishers also mentioned the general lack of employment, housing and social support structures such as secondary schooling and pension grants.

**Table 12**

**Stressors as identified by the workshop participants, Tombwa**

| Ecological | Socio-economic | Governance |
|---|---|---|
| Less fish than in past | Lack of employment | Lack of housing development |
| More seals | Lack of credit/financing | Need for communication with fishers and boat owners |
| Climatic changes (temperature, wind and currents) | Lack of engines and fuel | No pension fund |
| Air pollution (dust) | Lack of schooling, especially secondary schooling | |
| Desertification | Lack of transport facilities | |
| Freshwater influx from rivers brings grass and debris, which in turn affects fish gear, but it can also improve catches as it attracts more shrimp | Lack of salt | |
| | Lack of refrigeration on board and at landing sites | |
| | Lack of adequate fishing equipment | |

*Note:* Participants struggled to rank issues, so this was not included in this exercise.

***Historical review of key events***

Tombwa's developmental history is closely linked to the semi-industrial fishery. Participants recalled that between 1975 and 1985 more than 15 factories were operating, employing more than 1 000 people to process pelagic fish into fishmeal and fish oil. There were some factories located in Baia dos Tigres farther south as well. The Spanish established the factories with support from the government. This was also a time when many people from inland moved to Tombwa to flee from the civil war. Participants mentioned that during that period when the pelagic industry boomed in Tombwa there were few artisanal fishers with mainly a focus on beach seining in the lagoon. In fact, beach seines were already used during colonial times. Many women were also employed in the factories as fish cleaners and processors. From 1992 onwards, the factories were privatized again. However, the new owners did not possess the expertise to run this type of operation, and many factories started closing. By 1996, only two factories were operational, and they remained open until about 2004. During this time, more and more inhabitants of Tombwa turned to the artisanal fishery as a way of making a livelihood, and the number of chatas and beach seines increased. Women also began to play a strong role as traders as a way to distribute income among the community members.

Also in 2002, government, through its newly established programme for the development of artisanal fisheries, set up the first cooperative in Tombwa. By 2007, there were 13 GEIs registered in the local municipality. Some of these groups have not yet been able to register their cooperative, even though the government is subsidizing fuel for cooperatives nationwide. Separately, 5 women's cooperatives have been initiated (48 women all linked to the processing centre built in 2012). At one stage, larger vessels were used to tow chatas to farther fishing

grounds so as to increase the catch for the women cooperatives to process; however, this is no longer the case. Several years ago, the fisheries authority also implemented a programme to move fishers away from the use of bimbas as they were considered unsafe and did not adhere to maritime regulations. They provided 10 chatas to 60 youths as an alternative; they received training and were given a boat to be shared by a 5–6 men. They have formed GEIs. However, as many members do not possess identity cards, they have not yet been able to register their cooperative. Workshop participants said that this programme had helped but that at least another 300 youths were still using bimbas today.

In 2015, only one factory remains operational. This factory, employing almost 200 people is linked to 4 semi-industrial boats, which in turn provide employment for about 15 people (most of them not from Tombwa). Four independent purse-seiners are also still active and supply their catch to the women's cooperatives. More recently, there has also been a tendency to revive and strengthen the fishers' GEIs into cooperatives, as government has realized that fishers need continued support beyond the programmes run in the early 2000s.

In terms of environmental changes, workshop participants and fishers interviewed during the field visits were not able to discern any clear changing weather patterns in the last 10–30 years. Fishers mentioned the seasonal variations between summer and winter, but all said that the winds and currents had not changed over time. One fisher said: "Sometimes the sea is warmer, sometimes the wind is strong and there are strong currents, but that is just nature." Summer was regarded as the better fishing season as the weather was generally warmer. In winter, the weather was often cold and a larger number of seals would disturb fishing practices. During the field visits, an older fisherman at Pinda (Figure 23) was asked about changes in the environment and in the fisheries. He spoke a lot about the currents and said that the fishing was better when the current was moving from south to north. However, there had been no change in the currents since he started fishing: "Sometimes the currents came from the north and other times from the south."

However, with regard to the availability of fish throughout the year, many participants identified changes. While they did raise the fact that some fish species such as pargo, chern and mero "stay near the rocks" and as such are residential, they did not know, for example, why pungu disappeared, especially in winter even though places such as Baia dos Tigres and the mouth of the Cunene River had many pungu. One fisher said that the annual changes in abundance were a natural phenomenon. Another fisher said that a lot of Lula had been caught in December 2014 – these are normally only caught in June–July.

However, most fishers did say that they used to catch more fish in the past. For example, one fisher said that in 1982 fishers would go out (close to shore) at 07:00 and would fill the chata by 09:00. They would wait for buyers from the Democratic Republic of the Congo to arrive (normally around 15:00) before they beached the chata and sold the fish directly to the traders. Nowadays, fishers fish for the whole night (much farther from the shore) and still do not fill the chata. An older fisherman at Rocha Antigue (Figure 23) said that the number of fish had declined a lot since the early days. He said: "You used to be able to catch your fish within 5 minutes from the shore. Nowadays you have to travel far from the shore to capture fish." The women who buy and process from the semi-industrial fleet mentioned specifically that the supply of carapau (horse mackerel) had diminished.

Interviews with several traders in Tombwa corroborated the general perception of declining overall catches; not just individual catches due to a higher number of fishers. The traders, who sell their fish in larger cities, mentioned that the number of out-of-town traders had not increased, and that they themselves needed longer to fill their refrigerated trucks. While in the past they could load their truck in 1–2 days, they now need to stay in Tombwa for 4–5 days, even though there are many more fishers around.

***Impacts associated with environmental stressors and changes***

Workshop participants identified four species in particular that have declined in abundance over the past 5–10 years: corvina, atun, pungu and chern. This has affected the artisanal fishers negatively as it means that: (i) they have less income for their family (these species fetch good market prices); (ii) they need to buy more fuel to fish farther from the landing sites (for different species); (iii) after selling their lower-value fish, they have a smaller budget to go fishing the next day; and (iv) they sometimes struggle to meet the family needs, in which case they need to borrow money. Specifically related to the boat owners and their financial implications, the workshop participants mentioned that in some cases the boat owner argue that the catch by the crew is low, and boat owners may take the boat away from the fishers and find someone else to take out their vessel. They may also fire the skipper if he does not look after the boat or the fishing gear properly.

Causes for declining abundance of mainly these four species were attributed to several factors. First, some fishers argued that the closure of all the fish processing factories in Tombwa had had a major effect. The fishers suggested that while the factories were active, much of the guts and heads of the processed fish was discarded in the bay. This in turn attracted many fish, especially corvina. One fisher specifically suggested that less freshwater influx from the dried-up rivers meant that species such as pungu and corvina would not come so close inshore anymore. Two older fishers raised the fact that many more chatas were active these days, and that is why catches had declined. However, many other participants disagreed with this view and indicated that there seemed to be many more seals around. Seals were believed to be the main cause for declining catches. In the past, they said, people (authorities) used to shoot seals, but not anymore.

***Coping mechanisms***

During the workshop, and through the interviews at the landing sites and markets, the fishers highlighted several coping mechanisms.

**Fish for cachuchu throughout the year**

While fishing for cachuchu was mainly done in winter, fishers mentioned that they target this species all year round. They fish for cachuchu in deeper waters and often resort to targeting this species if other species are not found. The stock does seem to provide some sort of safety net for the artisanal sector operating out of Tombwa.

**Fish farther and deeper, going for longer fishing trips**

Most fishers said that nowadays they fish farther and deeper (depending on engines, 15–20 km), and go for longer, even overnight. They then take ice, food and extra fuel with them. Some fishers obtain credit from buyers in order to purchase fuel to go out farther.

**Women traders diversify their livelihoods and sell elsewhere**

Some women have started making yoghurt, ice cream, popcorn and cakes to sell at the fish market. However, they argued that selling is difficult when the fishers themselves make little money from catches.

A few people in the community who have access to transport go to sell their catch in different places (Namibe and Lubango). Women from the cooperatives mentioned that they do this from time to time. During the field visits, another women who buys directly from the artisanal fishers said that occasionally she travels with a small group of women traders who sell their catch in larger cities.

**Groups of fishers relocate to new fishing spots, temporarily or permanently**

Workshop participants estimated that there were about 150 chatas operating out of Tombwa, 50 from Pinda and another 30 from the areas close to Rocha. Pinda is a settlement just north of Tombwa that probably emerged as a traditional fishing centre along with Tombwa's industrial

development. The fishery has a large focus on using beach seines on the shallow bank (nursery ground). There are few motorized vessels.

While the Tombwa fishers did mention that their main coping strategy is to rely more heavily on cachuchu all year round, especially since the disappearance of pungo, it was evident from the field visits that individual fishers as well as groups of fishers have relocated farther up to coast to places such as Cabo Negra, Rocha Antigue and Rocha Nova. These are new settlements that have emerged in the last 10–20 years as the artisanal fishery in Tombwa has become saturated. A few people interviewed during the field visits said that they stay in Rocha during the week and then head back to Tombwa over the weekends to be with their families. Others have relocated their entire family to these new places. Some fishers reported temporary camps as far south as Baia dos Tigres, although this was not confirmed.

**Use different fishing gear**

In an attempt to improve catches and target different areas than the chatas, many younger fishers have turned to the use of bimbas. Bimbas were first used as early as 1991. While bimbas had always been used by young men as a way to practice and enter the fishery, it appears as if a dedicated bimba fishery has developed. The advantage of bimbas is that one can fish closer inshore than with a chata and thus target reef fish close to cliffs and even in the surf zone. Interviews and field observations were used to generate Table 13, showing how bimbas target different fish from chatas. Normally, the chatas operate individually from the shore. However, in Rocha Antique, there are fibreglass boats that transport these bimbas to the fishing grounds. This started happening about seven years ago.

During the field observations in Pinda, it was noted that bimbas seemed able to catch larger fish in inshore zones, and their catches were generally larger than those of the chatas that landed at the same time.

**Table 13**

**Catches by fishers using bimbas**

| **Winter** | **Summer** |
|---|---|
| Marequita, Blacktail seabream (*Diplodus sargus* spp.) | Corvina, Geelbek croaker (*Atractoscion* spp.) |
| Lula, Good Hope squid (*Loligo reynaudii*) | Runcador, Grunter (*Pomadasys rogeri/ peroteti*) |
| Corvina, Geelbek croaker (*Atractoscion* spp.) | Bogue |
| | Kisenga, Dentex (*Dentex barnardi*) |
| | Tico tico, Red pandora (*Pagellus belloti*) |
| | Guemba, West coast dusky kob (*Argyrosomus coronus*) |

*Note*: This is based on observation in Tombwa only.

Beach seines with small mesh sizes were also outlawed several years ago; however, fishers still use them.

Gillnets were introduced in 1995. However, seal numbers have recently increased, and the use of gillnets is declining because the seals prey on the captured fish. Gillnets largely target corvina and rays. Fishers have switched from gillnets to traps to reduce predation by seals in the last three years. Traps have been around for a long time. However, they have only really been used in the last three years when the gillnet fishery stopped being viable. These traps are baited with sardinella, and the species captured are primarily corvina, chopa and marequita. Several large

octopus that had been captured in the traps were seen in Rocha during the field visits. The traps were mostly observed at Rocha Antigue.

***Adaptation strategies and needs***

Throughout the workshop, participants identified a number of strategies that they believed could improve their vulnerable situation as artisanal fishers. These were listed and discussed in the final session. However, it is important to highlight that moving to an artisanal fishery in itself has been a crucial adaptation strategy for the Tombwa inhabitants. Many had started in the fishing sector by working for the semi-industrial fishery. Once these factories closed down, but market demand from the cities remained high, fishers started to develop the artisanal fishery. With government support, women have gained training and access to infrastructure for the processing of the semi-industrial catch.

Although fishers were able to identify the main problems to be addressed, they could not discuss adaptation needs and strategies, as had been done in the other case studies. Rather, they listed a series of activities that needed to be done. The following were highlighted by the workshop participants as urgent needs for improving their livelihoods:

- Diminish the number of seals.
- Obtain more gillnets.
- Need technical assistants, spares to fix boats and engines.
- Need GPS and depth finders.
- Some type of price regulation/standardization, so they can better plan fishing trips and targeted fish.
- They need refrigeration in the cooperative centres.
- They need more fibreglass chatas.
- Training to manage cooperatives, fix engines, skipper training.

Building on their recent organizational development, fishers need training and support programmes in order to make the GEIs operational as cooperatives, run the cooperative accounting, better market their catch and improve on the collaboration among community workers. Participants highlighted that they had started to make these changes or improve their fishery themselves, but that they would also need continued support from the Ministry of Fisheries. With this group, it proved very hard to discuss adaptation ideas and options that would relate to fisheries management, as most were concerned with the further development of their fishing technology and marketing. Discussions with IPA officials and observations from the field visits did indicate that the development of a sustainable management plan for cachuchu would be urgently needed. Several mariculture options in the lagoon would provide additional livelihood opportunities as well.

# 6. DISCUSSION

## 6.1 Findings

### *6.1.1 Stressors and threats across the region*

The main stressors and threats identified by fishers and fishworkers during the workshops were in the **socio-economic category** (Table 14) and were largely concerned with lack of basic infrastructure (in general and related to fishing) and housing (South Africa). Other major problems identified were: alcohol and drug abuse, lack of access to finance/credit to improve fishing practices and lack of equipment (protective gear, clothes) in Namibia; and lack of access to credit and basic infrastructure in Angola. In the **management/governance category,** poor communication and lack of support from the fisheries authorities were common concerns across all three countries, and in South Africa a key stressor identified was that "fish buyers set the prices". This latter stressor could also be interpreted as a socio-economic stressor; however, it was identified under governance, as fishers believe that buyers end up directing who obtains the permits. Under **ecological stressors and threats**, in all three countries, reduced individual catches were identified as a key stressor that exacerbated an already vulnerable situation. Records of total catches and total fisher populations, as well as changes over time for each area, were not available. Thus, it was not possible to confirm whether there had been a reduction in total catches per area. However, a decline in total catches was possibly only confirmed in Tombwa, as traders at catch accumulation points mentioned that they needed more time to load their trucks as there was an increased number of fishers but a similar number of traders. In South Africa, at all workshops, participants identified "climate change" as an environmental stressor, although some were able to unpack this general concept more specifically and identify physical and biological changes that they attributed to climate change. The greater awareness about climate change in South Africa can be attributed to various projects implemented by researchers and NGOs in selected coastal communities that have focused on raising awareness about climate change and have involved fishers in collecting local data. However, in these projects, it is important to note that limited attention was given to exploring the difference between climate change and climate and environmental variability (interannual and decadal cycles). As a result many fishers will have attributed their observations of environmental variability and change to climate change specifically (see Sections 6.1.2 and 6.1.3).

At all case study sites in South Africa, fishers perceived a change in the seasons (winds start blowing later in season, winds that used to signal arrival of certain fish species are no longer reliable) and this has led to uncertainty and unpredictability, and an inability to plan. In Namibia, both the women in Walvis Bay and the fishers in Henties Bay reported changing environmental conditions, including less predictable weather and heavier storms coming from the south. In Angola, while fishers perceived the sea to be warming, and certain species to be disappearing or only found farther out to sea, there was uncertainty regarding the key driver of these changes. Rougher sea conditions were identified in all cases and affected time at sea, income and poverty levels, especially in view of very limited alternative livelihood opportunities.

For the workshop participants, the stressors that were "top of mind" and hence prioritized were those affecting their daily lives, family and living situation. Increased coastal populations and pressures from the small-scale fisheries sector were not identified as an issue or stressor in any of the cases, as most fishers regarded their fishing activities to be much less of an impact than the industrial boats. Climate change (except in the case of Doringbaai, where a project focusing on climate change had recently been conducted) was not identified as a key stressor or threat. However, when unpacked through the various exercises, it took on greater importance as fishers realized the environmental and climate changes they had experienced or perceived may well be affecting fish catches. Through the discussion of the various stressors, what became obvious was that these stressors are interlinked and together exacerbate vulnerability. Lack of access to credit and lack of support from government limited fishers' ability to take action themselves to deal with the stressors and changes experienced.

**Table 14**

**Common stressors/threats across case studies**

| *Common stressors/threats* | | |
|---|---|---|
| Ecological:<br>• Unpredictable weather and seasonal changes (wind, currents and species distribution)<br>• Rougher sea conditions (less time at sea)<br>• Declining individual catches (need to fish harder, longer, farther) in a more competitive environment | Socio-economic:<br>• Lack of infrastructure and housing<br>• Lack of employment and additional income-generating opportunities<br>• Substance and gender abuse<br>• Lack of adequate equipment (including safety gear)<br>• Lack of finance or access to credit<br>• Lack of health services and education<br>• Lack of markets | Management/governance:<br>• Lack of communication with and support from government<br>• Conflict with overlapping commercial or recreational sectors<br>• Rules and regulations not negotiated |

### *6.1.2 Knowledge and perceptions with respect to environmental variability and climate change*

In some tropical fisheries, there have been recorded increases in frequency or intensity of major environmental events (floods, large storms, tsunamis). However, there have been few major extreme events in the BCLME. Aside from the red tide event in the mid-1990s and the unusually high seas of 1984 in South Africa, no major environmental events were mentioned. Rather, fishers reported on their experiences at sea and perceptions of environmental variability and change over several years of being involved in the fishing sector, or referred to knowledge they had obtained from previous generations. Although one of the exercises asked fishers to identify specific events or changes that affected livelihoods, those listed were mainly linked to political, socio-economic and governance events or changes rather than environmental changes. Thus, discussions about fishers' experiences (reduced individual catches, having to travel farther, rougher seas, stronger winds and warmer waters) were based on how they perceive fishing and environmental conditions now relative to the past, where the past depended on the fisher's age and number of years involved in the fishing sector.

There was some debate about certain environmental changes identified, for example, in Saint Helena Bay fishers had different views about how long it took for resources to recover after the red tide event (from 5 to 14 years). However, there was consensus on the main environmental stressors and changes identified. There was less clarity about the period over which these changes have been observed or perceived. For example, fishers in Struisbaai in South Africa claim that the southeasterly winds are arriving later in summer than in previous years, but it is not entirely clear when this change was first observed. Obtaining further information on these issues would require more in-depth individual interviews and/or focus-group discussions with different age groups, although obtaining clarity when these changes were first observed may be difficult. Similarly, fishers' perceptions that sea conditions are rougher than before were difficult to pin down, except that fishers claimed they have fewer days at sea now than in

previous years (Angola). Rougher seas was identified in all three countries, but there were no dates linked to this. When this was probed in Angola, some fishers claimed that their parents had told them of rough sea conditions in previous times before they started fishing and the conditions experienced now were no different from when they were fishing historically. Thus, the difficulty of clarifying the time frame of changes experienced (e.g. reduced catches) and perceived (e.g. stronger winds, rougher sea conditions) made it difficult to pick up definite trends. At times, fishers made contradictory statements about perceived environmental changes. For example, fishers in Cacuaco claimed that the sea temperature was generally warming and that this was affecting quality of certain fish species. Yet, in Barra do Dande (60 km farther north along the coast), one fisher insisted that the water had been colder in the previous winter season, delaying the arrival of certain fish species. Thus, the feedback from the workshops and the focus-group discussions needs to be placed in a temporal context, and one has to guard against searching for trends when they do not exist.

Although it was not always possible to represent the observations and perceptions of fishers using a well-defined temporal scale, or confirm definite climate trends, it is nonetheless important to capture these inputs in an RVA. Often, it is these perceptions that drive certain actions, coping mechanisms and, possibly, longer-term adaptation strategies.

### *6.1.3 Difficulty of linking changes in the fishery (experienced and perceived) to climate change or other factors*

Aside from the red tide event on the west coast of South Africa in 1994–95, most of the environmental stressors identified were linked to environmental changes over a range of periods. In all three countries, fishers were uncertain about the causes of change observed. Moreover, experience and perception of change can be nuanced or influenced by impacts experienced from decreased individual catches, and by other fishery-induced effects such as new permits and regulations, better gear, market changes or increased conflict with other sectors such as the commercial and recreational fisheries. A person's or group's claim made during a once-off workshop can also be influenced by the individual's agenda or current socio-economic needs and aspirations. It is thus important to ensure that the results of the RVA are considered within a broader perspective. The linkages between perceptions and individual or collective strategies to deal with these changes need careful consideration before action is taken. In-depth local participatory research may be necessary to further investigate participants' observed and perceived environmental changes.

Nevertheless, during the RVA, most fishers attributed less fish or reduced catches to increasing pressure from industrial fisheries and increasing numbers of small-scale-fishers (and in Angola some cited the use of unsustainable gear). They identified environmental and climate change generally, and specifically mentioned rougher seas, changing seasons and warmer sea temperatures as possible contributing factors to reduced catches and the disappearance of certain species. In some workshops, when probing fishers' views on possible causes of perceived environmental changes many simply said "it is nature" or "we do not know" while others said "it is climate change". Reasons for the disappearance of certain fish species from traditional fishing grounds were also attributed to both increased fishing pressure (by industrials) and possibly climate change. Most fishers believed that by reducing fishing pressure from the industrial sector – reduced fleets, reduced quotas, restrictions on gear, demarcation of exclusive fishing zone for fishers – the status of fish stocks would improve.

Discussions about the possible links between environmental stressors and changes identified and climate change were tentative. Fishers felt that the only way to improve understanding would be to involve fishers in data collection and ongoing discussions on interpretation of such data. They also requested more input from scientists regarding their findings (South Africa). Fishers in South Africa and Angola in particular felt strongly that they should be more involved in data collection on environmental indicators such as temperature, wind direction and velocity, as well as total catches and catch composition, and other observations made on fishing trips to generate local-level information for a better understanding of environmental variability, change

and climate trends. They were aggrieved that they were not consulted about environmental and fishery issues, as management decisions affect them directly.

### *6.1.4 Linking fishers' observations and perceptions to available science*

Despite the fact that many fishers were unable to link their perceived environmental changes to climate change specifically, the fishers did raise a few important changes that seem to resonate with the latest available science for the BCLME. However, it is important to highlight that this project aimed to develop and pilot an RVA. The focus was on obtaining the views and perceptions of fishers with regard to stressors and changes that affect their livelihoods, and not only on questions related to environmental and climate change, although the latter was the focus of the second day of the workshop. In many instances, there was no time to fully explore issues raised in the workshop, or conduct follow-up focus group discussions. In addition, perceptions are influenced by the nature of one's fishing activities, age and time of involvement in the fishing sector. The context of the RVA workshop also needs to be taken into account. At almost all the case study sites, small-scale fishers used the opportunity to raise issues and needs that they hoped could be resolved by outside facilitators and interventions. However, it was important to remain focused on the overall aim of the RVA, namely: to provide an initial opportunity for community members to identify stressors, and environmental stressors in particular, with the focus on identifying coping mechanisms and adaptation strategies that they would want to pursue as a collective and which could be further developed in partnership with different stakeholders.

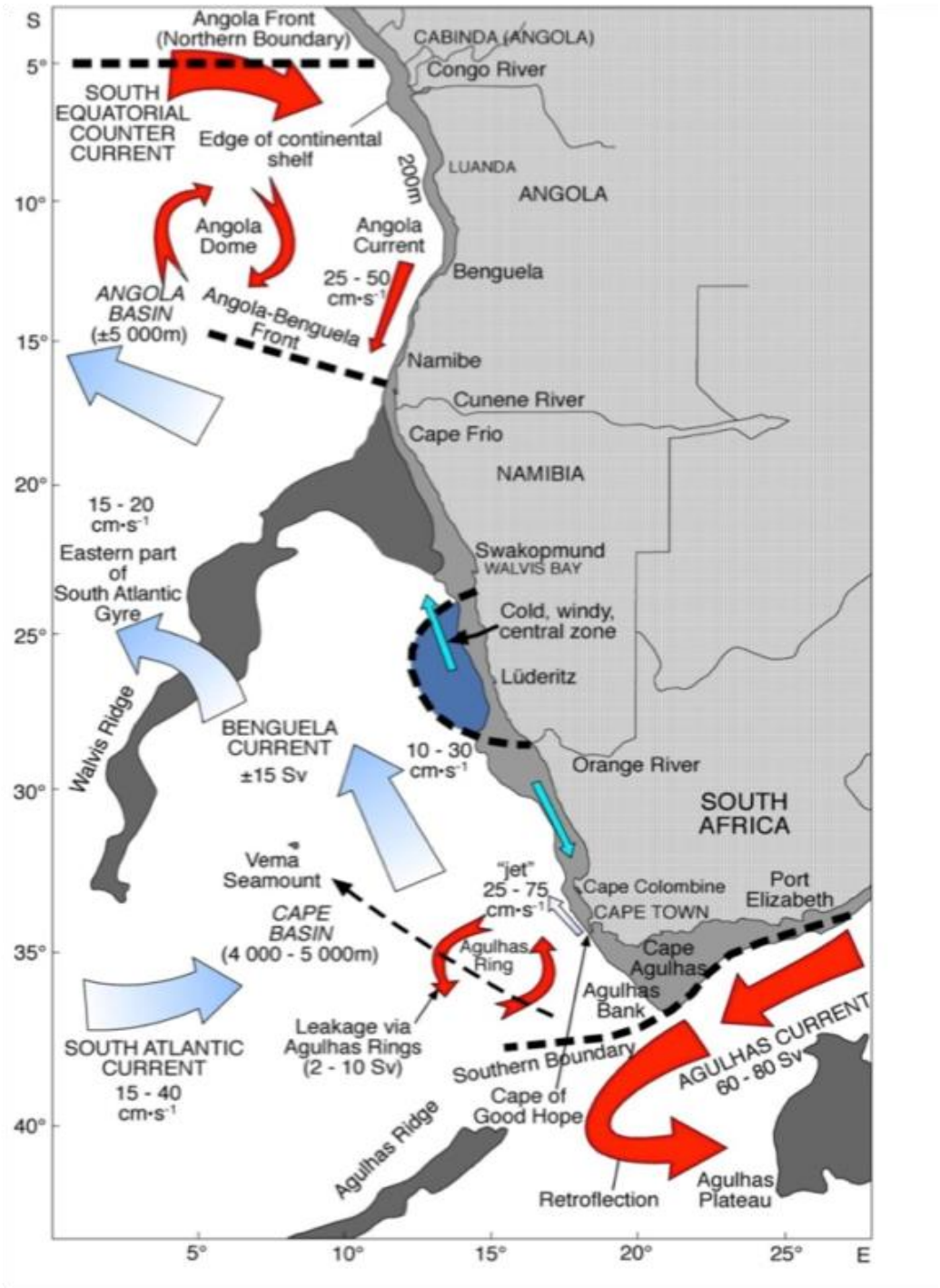
Despite the scale differences between fishers' local observations and analysis of regional patterns in the scientific literature, some trends seem to correlate. After discussions with climate variability/change scientists from the region, and more specifically after having reviewed the findings of the NansClim[5] programme, the following section aims to highlight key findings from the RVA and compare this information with the relevant scientific literature. The focus is on climatic changes and not on reduced abundance of species due to heavy fishing pressure.

The Benguela Current extends from Angola to South Africa (Figure 24) and is characterized by cold, nutrient-rich waters, which flow in a northerly direction (Cury and Shannon, 2004). At the Angola–Namibia border, the Benguela Current meets the Angola Current in what is known as a front, effectively delineating three subsystems (Angola subtropical; Angola–Benguela front and northern Benguela). The other subsystem is influenced by the Agulhas Current, which flows in a westerly direction around the east coast of South Africa and is characterized by warm, nutrient-poor water (Cury and Shannon, 2004). Case studies were located in each of the four subsystems (Table 15 and Figure 24).

[5] Project funded by the Norwegian Agency for Development Cooperation (NORAD) between 2010 and 2013 on climate effects on biodiversity, abundance and distribution of marine organisms.

**Figure 24**

**Overview of the Benguela Current large marine ecosystem**




*Source*: Cochrane *et al*. (2007).

According to scientific consensus, the Benguela Current Large Marine Ecosystem (BCLME) is currently observed to be undergoing changes. It is predicted that the BCLME "may well be an early site for the manifestation of global climate change" (Cochrane *et al*., 2007). The system is a highly complex and variable one "that displays considerable environmental variability on several time and space scales, which is mirrored by variability in its living marine resources"

(Cochrane *et al*., 2007). This characteristic of the system makes it difficult to discern which changes are natural or from other pressures, and which changes are climate change induced (Hampton, 2012). The BCLME is already facing a large number of anthropogenically induced challenges aside from climate change. These include: pollution, fishing, mining and oil and gas extraction (Cochrane *et al*., 2007). The effect of these pressures, which become superimposed on one another and thus have to be thought of in terms of complex systems, are vast.

Key in the review of scientific literature is the fact that the BCLME is considered a highly variable system in terms of temporal and spatial scales. It also needs to be noted that the scientific research presented in various reports and papers has been conducted at various temporal and spatial scales, although Jarre, Ragaller and Hutchings (2013) provide a synthesis of climate effects on biodiversity, abundance and distribution of marine organisms across the Benguela system. Fishers interviewed were mainly documenting their experience and perceptions of change based on their fishing activities in local fishing grounds. Exceptions to this included the South Africa line fishers who follow the fish and fish on both the west and south coasts of South Africa. Table 15 summarizes the climate-related changes experienced or perceived by the fishers attending the RVA workshops in all seven case study sites, and contrasts these with published scientific findings.

**Table 15**

**Main changes observed by the RVA workshop participants in the BCLME case study sites, and main available scientific insights per BCLME subsystem**

| Subsystem within the BCLME | Case studies | Workshop participants, i.e. small-sale fishers | | Scientific knowledge (NansClim and other BCLME-related research) | |
|---|---|---|---|---|---|
| | | **Perceptions of environmental/climatic variability or change** | **Species specific perceived changes** | **Climatic variability and changes** | **Species specific scientific knowledge** |
| Angola Subtropical | Barra do Dande, Cacuaco | Warmer water temperatures.<br><br>Rougher sea conditions, which seem linked to stronger currents and stronger winds. More storms. | None documented linked to climate. | Mean sea surface temperature has increased since the 1980s, resulting in lower contrast between summer and winter.<br><br>Increase in ENSO events. | Decrease in horse mackerel and sardinella due to environmental but mostly fishing pressure, with some recovery of horse mackerel and hake. |
| Angola Benguela Front | Tombwa | *Could not discern any clear climatic related changes.* | Disappearance of large pungu (kob). | Mean sea surface temperature has increased since the 1980s, throughout the year.<br>Decrease in upwelling favourable winds. | Increase in fur seals between 1956 and 2005.<br><br>Weakening front affects movement of fish.<br><br>Hybridization of fish species such as west coast dusky kob and silver kob. |
| Northern Benguela | Walvis Bay, Henties Bay | Less predictable weather. Unexpected sea conditions and more unpredictable weather on daily basis but also less distinct fishing "seasons". | There is no clear seasonal separation on what species are dominant at any particular time of the year. | Events of warm water intruding south from the northern system.<br><br>Decrease in upwelling in the northern system (but closer to Luderitz since 1960s). | This water has a lower salt and oxygen content, and thus affects several organisms. |

| Subsystem within the BCLME | Case studies | Workshop participants, i.e. small-sale fishers | | Scientific knowledge (NansClim and other BCLME-related research) | |
|---|---|---|---|---|---|
| | | **Perceptions of environmental/climatic variability or change** | **Species specific perceived changes** | **Climatic variability and changes** | **Species specific scientific knowledge** |
| | | Heavier storms coming from the south.<br>Waves and tides are perceived to be bigger and stronger than before.<br><br>More SW and less SE winds: long calm misty conditions in the past while now these periods are often disturbed by strong southerly winds. | Shells are more brittle (could be linked to use of different species) | | |
| Southern Benguela West Coast | Doringbaai Saint Helena | General: unexpected sea conditions and more unpredictable weather on daily basis but also less distinct fishing "seasons".<br><br>More SE winds in summer but frequency and strength only increases later in season (in Jan–Feb and not in Nov–Dec). Winters are milder, but longer characterized by dominant SW currents and winds. The SW current is warmer and stronger. | General: changing seasonal distribution and availability of fish (e.g. new species, disappearance of species).<br><br>Specifically to WCRL, the Doringbaai fishers argue that berried females move inshore sooner in the season than farther south (not clear whether this was always the case or whether this is an issue now due to regulations and linked to wind changes). | Warming of offshore waters due to stronger, warmer Agulhas current and leakage into Benguela.<br><br>Cooling of inshore waters: increased upwelling and increased upwelling variability through dominant SE wind in summer, possible starting later (shift from Nov to Dec–Jan).<br><br>A cooling of near-shore waters on the south and west coast of South Africa but a warming of the sea | Shifts in the distribution of sardine from the west to east of Cape Agulhas between 1985 and 2005<br><br>An increased abundance of lobster on the south coast of South Africa has been documented. This is believed to be local regime shift due to favourable environmental conditions and local depletion of predators. At the same time, |

| Subsystem within the BCLME | Case studies | Workshop participants, i.e. small-sale fishers | | Scientific knowledge (NansClim and other BCLME-related research) | |
|---|---|---|---|---|---|
| | | **Perceptions of environmental/climatic variability or change** | **Species specific perceived changes** | **Climatic variability and changes** | **Species specific scientific knowledge** |
| | | Overall, winters are less predictable: In winter the northerly wind is not as predictable anymore. It used to blow for days, but now only blows in morning and is followed by southerly winds. | The warmer SW current brings more "south coast" species such as yellowtail, geelbek and yellowfin. They catch many of these species among the snoek shoals.<br>The snoek season is not as defined anymore but seems longer. The northerly wind no longer predicts the arrival of snoek.<br><br>Red tide events in the mid-1990s caused significant decline in WCRL, in particular in Saint Helena Bay. | surface waters in the Benguela Current could result in an intensification of weather events due to the sea's temperature gradients.<br><br>Increase upwelling southern system – cooling of inshore waters south and west of South Africa can result in increase in abundance of plankton and, in turn, increase frequency of harmful algae blooms.<br>A decline in the oxygen levels below the thermocline has been observed in some areas in the south, most notably in the Saint Helena Bay region. | a decreased abundance of lobster along the west coast due to heavy fishing pressure has also been exacerbated by a slower growth rate due to increased upwelling.<br><br>The frequency of harmful algal blooms has increased; this has negative impacts for certain species and ecosystems. |
| Southern Benguela South Coast | Struisbaai | More SE winds in summer but frequency and strength only increases later in season (past: Oct–Nov; now: Dec–Jan). This means the summer fishing season is shorter | With SE winds increasing only later, summer fishing season for nomadic species is shorter. | Warming of offshore waters due to stronger, warmer Agulhas current and leakage into Benguela.<br><br>Cooling of inshore waters: increased upwelling and increased upwelling variability through | Not documented. |

| Subsystem within the BCLME | Case studies | Workshop participants, i.e. small-sale fishers | | Scientific knowledge (NansClim and other BCLME-related research) | |
|---|---|---|---|---|---|
| | | **Perceptions of environmental/climatic variability or change** | **Species specific perceived changes** | **Climatic variability and changes** | **Species specific scientific knowledge** |
| | | Winter is characterized by less severe storms and more SE current. | | dominant SE wind in summer, possible starting later (shift from Nov to Dec–Jan)<br><br>A cooling of near-shore waters on the south and west coast of South Africa, but a warming of the sea surface waters in the Benguela Current. This could result in an intensification of weather events due to the sea's temperature gradients | |

*Note:* More general observations of individual catch decline, total catch decline and changes in species abundance are not included in this table but are described in the actual case studies. The table focuses on changes that fishers observed/perceived and that could possibly be attributed to climate/environmental variability and change.

*Source:* references in accompanying text.

#### *6.1.4.1 South Africa*

Fishers in Doringbaai and Struisbaai spoke of stronger southeasterly winds in summer, but only gaining in frequency, strength and duration later in the year, i.e. January–February vs November. In winter, fishers spoke of dominant southwesterly winds, less predictable weather and generally warmer currents. Blamey *et al*. (2012), Blamey *et al*. (2015) and Jarre *et al*., (2015) all document evidence of increased upwelling and upwelling variability linked to southeasterly dominance in summer months starting in the 1990s. A shift in timing of this southeasterly dominance from November to December–January is being investigated. Preliminary analyses of windspeed data seem to correlate with what the fishers are saying about a shift in season/increased southeasterly winds later in the year (L.K. Blamey, personal communication) The average windrun (or windspeed) for southerly winds over time per summer month (i.e. November, December, January and February each plotted individually from 1960 to 2010) shows a declining trend in southerly winds, whereas December and January show an increasing trend in southerly winds over time, suggesting that the dominant southeasterly might have been becoming weaker in November, but then stronger in December and January. In winter, warmer water could be linked to the observed warming of offshore waters in the Benguela Current due to a stronger Agulhas Current, and "leakage of Agulhas" water into the Benguela Current coupled with a dominant southwesterly wind. This has been documented by Rouault, Penven and Pohl (2009) and Rouault *et al*. (2010). Less predictable weather conditions could be explained by the cooling of inshore waters but a warming of the surface waters in the Benguela, resulting in an intensification of weather events.

According to the scientific literature, the increased upwelling brings about colder inshore waters but can also increase the frequency of algae blooms, which is followed by oxygen depletion driven by decay of phytoplankton during calmer periods. Blamey *et al*. (2012) and Jarre, Ragaller and Hutchings (2013), using wind time series data since 1949, report on severe oxygen depletion in the early 1950s and 1990s, but improved conditions in the 1960s, 1970s and possibly the 2000s. The extreme red tide event of the early 1990s was identified by the Saint Helena Bay fishers as a significant negative event that had major impacts on fish catches and far-reaching socio-economic consequences for the fishing community.

With regard to fish catches, a warmer current could affect the distribution of migratory fish species. Fishers in Doringbaai mentioned the increased occurrence of "south coast" species such as yellowtail and geelbek in their catches; however, this could also be due to their improved gear. Many fishers have obtained motors and thus can travel farther offshore. Fishers at Saint Helena Bay mentioned that they used to catch these species in the bay. This was also confirmed by an older Doringbaai fisher; hence, this observation would need further investigation.

In Doringbaai, fishers also identified a number of changes pertaining to the lobster resource, i.e. possible longshore and offshore migration changes from Doringbaai to Elandsbaai, seasonal changes in abundance of males vs females, changes in reproduction periods. The attribute all of these changes to changes in patterns of southeasterly winds, practices of commercial trap fisheries, and diamond mining. Fishers were undecided about whether these annual changes in local lobster abundance and male–female ratio could be attributed to increased commercial and small-scale fishing effort, changed regulations (opening of small-scale fishery later in season) or longer-term lobster migration changes that some fishers had observed. Scientific knowledge of the WCRL population suggests lobster have a narrow longshore range, but that the males and females have different inshore–offshore movement patterns, and this differs according to latitude along the west coast (Atkinson and Branch, 2003).

However, a larger-scale shift in abundance of commercially valuable WCRL (*Jasus lalandii*) is well documented in the literature (Blamey *et al*., 2015; Blamey *et al*., 2012; Cockcroft, van Zyl and Hutchings, 2008). On the west coast, the last ten years have seen a proportional decline in WCRL catches from 60–70 percent to about 10 percent, while the proportion of lobsters caught on the southwest coast has increased to 70 percent from 10 percent (Blamey *et al*., 2015). This shift in abundance has coincided with an increase in upwelling and southerly winds and has had a significant effect on the WCRL's ecosystem, especially on kelp ecosystems, the diet of the Cape clawless otter, the breeding regions of the bank cormorants and has negatively affected the populations of urchins and

abalone, where there have been increases in WCRL (i.e. on the southwest coast) (Blamey *et al*., 2015; Blamey *et al*., 2012). The cause of the distributional shift from the west to southwest coast is inconclusive. However, Blamey *et al*. (2015) hypothesize three key factors that could have contributed to the spatiotemporal change in WCRL and, therefore, the "catch and effort":

- The growth rate of lobsters has decreased since the 1980s, possibly due to an increase in upwelling, which has decreased the quality and availability of food for the lobsters. The effect of this is fewer lobsters reaching the legal size limit. Blamey *et al*. (2015) state: "Although fishing has probably played a role, the slowed lobster growth rates are most likely the result of a combination of low oxygen, reduced primary production, food availability and competition" as well as a cooling of the southwest coast's inshore waters (Blamey *et al*., 2014). This is significant as it means a reduction in the percentage of lobster legally available to be caught (Pollock *et al*., 2000).
- The last two decades have seen five lobster "walkouts". Three of these were very severe "with one event resulting in the loss of ~2000t – about equal to the annual national catch" (Blamey *et al*., 2015). This therefore had a significant effect on the population size of the WCRL.
- There was a dramatic shift of lobster abundance in False Bay in the 1990s, perhaps from a sudden high concentration of adult lobsters. However, the sudden shift is not fully understood but could potentially reflect a cause of the distributional shift to the southwest coast on a more localized level (Blamey *et al*., 2015).

#### *6.1.4.2 Namibia*

In Namibia, because of the mostly shore-based fishing activities of the participants, it was more difficult to discern environmental and climate-related changes and clarify their effects on fish populations and fishing activities. Nevertheless, fishers and shell collectors noted less predictable weather, changing seasonal distributions of certain fish species, and more southwesterly winds. The Walvis Bay women also noticed that shells of the same species (white mussel) had become more brittle. The Henties Bay fishers have noted less southeasterly winds, while scientific research has detected decreased upwelling in the northern parts of the BCLME, although this has been observed closer to Luderitz (Jarre *et al*., 2015).

#### *6.1.4.3 Angola*

In Angola, fishers in both Barra do Dande and Cacuaco reported warmer sea temperatures. This seems to corroborate with scientific literature that reports a lower temperature contrast between summer and winter and generally warmer sea surface temperatures in winter (Jarre *et al*., 2015).

In Tombwa, workshop participants and fishers interviewed during the field visits were not able to discern any clear changes in environmental conditions and weather patterns in the last 10–30 years (Section 5.3.3). A possible explanation is that the bulk of the local artisanal fishery is at most two generations old, and that most workshop participants and fishers observed during the fieldwork were young (average 35 years). This combined with a technological creep over the last 10 years could mask any possible trends.

An increase in the abundance of the Cape fur seal (*Arctocephalus pusillus pusillus*) was largely blamed for the poor recent catches in Tombwa. There is very little scientific information on the seals. An aerial survey of Ilha dos Tigres (situated about 80 km south of Tombwa) in 2001 suggested that there were tens of thousands of seals on the island. A land based survey in 2014 estimated similar numbers on the island. However, anecdotal reports from scientists in the south of Angola suggest that their numbers have increased significantly since 2005 and concurs with the observations by fishers. Recent work in southern Africa suggests that the number of seal colonies is on the rise and that there has been a general shift of the colonies out of southern Namibia into northern Namibia and southern Angola. Kirkman *et al*. (2013) attributed this change to the shift in availability of pelagic fish prey from south and central Namibia into northern Namibia and southern Angola.

Fishers in Tombwa specifically complained about the impact of seals, as they tended to eat the fish captured in the fishers' gillnets and on their lines. Their assumption is that seals consume their

dominant fish species such as cachuchu (*Dentex macropthalmus*) and corvina (*Atractoscion aequidens*) in the natural environment and contend that the seals are affecting the artisanal fishery. However, there is little evidence to suggest that this would be the case, with the majority of studies showing that seals prefer pelagic fishes such as horse mackerel, sardines and hake (David, 1987).

Some climate change impacts, such as stronger currents, warmer oceans and rougher seas, were observed by artisanal fishers in the north. This is supported by Potts *et al*. (2014), who found that coastal sea temperatures have been increasing rapidly (> 0.6 °C per decade) in this region since the 1970. However, artisanal fishers in Tombwa did not report any change in ocean temperature. The reduction in the abundance of pungu (*Argyrosomus coronus*), which was noted as one of the species that had declined the most, was also partly attributed to the impacts of ocean warming.

In conclusion, it can be said that many of the changes experienced by the small-scale fishers seem to resonate well with the available science on environmental variability and climate change in the BCLME region. This link between science and local knowledge needs more directed research, as most research has thus far been directed at industrial fisheries and very little is known about environmental changes affecting small-scale fishing communities along the BCLME coast. For example, very little is known about changes in the distribution of line-fish species – a fishery upon which many small-scale fishers depend. In addition, fishers who attended the RVA workshops may have attributed certain observations and perceived changes to climate change while in fact these changes could have been linked to decadal or interannual environmental and climatic variability in the BCLME. From the available scientific information summarized in this section, it is clear that environmental and climate variability and even change is more subtle, and fishers may not perceive the effects of environmental change when compounded by other stressors such as declines in fish stocks, technological improvements, new fishing regulations, and market fluctuations. Moreover, in-depth participatory local monitoring and research is therefore needed at community level. This combined production of knowledge at different scales could be mutually reinforcing as well as guide the attunement of the different coping and adaptation options suggested during the RVAs.

### *6.1.5 Coping mechanisms and adaptation strategies*

Fishers in all case studies identified coping mechanisms to deal with the stressors and environmental changes they experienced, although they said these were largely unsatisfactory and could not be seen as sustainable long-term strategies. Workshop participants highlighted the fact that they were accustomed to hardship and finding ways of coping and would share and support one another where possible. For example, after the red tide event in Saint Helena Bay, lack of resources resulted in fishers harvesting seabirds, seaweed and various shellfish to survive. In cases where government rules affected livelihoods and ability to earn an income, most fishers indicated that they continued to fish despite restrictions (marine reserves, no permits, illegal gear), and in Angola fishers and fishworkers said when fish was scarce they would use illegal gear (banda banda) to catch fish, and women would catch small sardines.

In most cases, participants stated that alternative or supplementary livelihood opportunities were scarce, and that they did not want to work in another sector, as fishing was not only their livelihood but also a way of life, and part of their culture and identity. However, when fish is scarce or conditions prevent them from going to sea or income from fishing is inadequate to support their families, men will look for other work (usually ad hoc work) while women will often cook and sell food, or in the case of the Walvis Bay shell collectors use other materials to make jewellery. Fishworkers (mainly women) also spoke about moving inland (Namibia) and to other fishing areas (Angola) to find work or buy fish. In South Africa, line fishermen with the means (trailers and money for fuel to transport a boat) follow the fish and spend time in other fishing villages. This creates conflict with local fishers who are totally dependent on local fisheries resources. Fishers and fishworkers also borrow money from boat owners or buyers, and while this may alleviate the immediate situation, fishers become indebted to those providing the loans. However, boat owners in Angola indicated that when there is limited or no fish available, they have to borrow money from the “big buyers”, who then have a lot of power over setting prices in the following season. This mean that buyers of fish are then able to set the price for fish, and fishers have no bargaining power.

Throughout the workshops, fishers identified strategies that could assist them in adapting to change. While the focus of the final workshop exercise was on exploring adaptation strategies to address environmental and climate change, many of the strategies identified were relevant to addressing their vulnerabilities in general terms. Suggestions were often not directly linked to the environmental stressors and changes observed. Instead, they were more general in nature, and aimed at increasing the overall resilience of the fisher community to a myriad of social and ecological changes.

Proposals to become more organized at the local level, establish local organizations and cooperatives, or join existing GEIs or cooperatives in the case of Angola, were considered critically important actions in most communities. However, support from community leaders and cooperative members, as well as from the government department responsible for fisheries management, is required. While fishers recognized the benefits of being better organized, they expressed frustration at lack of government support and indicated a need for NGOs and CBOs to provide greater support.

**Table 16**

**Common adaption needs across case studies**

| **Common adaptation strategies identified** | | |
|---|---|---|
| **Immediate improvement in comfort, safety and security** | **Adaptation strategies that can improve people's livelihoods without necessarily addressing resource or other ecological concerns** | **Far-reaching changes with the potential to uplift communities as a whole** |
| Better and safer equipment including GPS, VMS, radios, Internet access as well as protective clothing, torches and associated training | Better organization at local level (i.e. cooperatives) | Improve compliance with destructive fishing practices |
| | Improve infrastructure and facilities including post-harvest facilities | Identify and develop additional income-generating opportunities (aquaculture, agriculture, tourism) |
| | Improve marketing of fish | Recognition and protection of fishers in law (e.g. protect rights of small-scale fishers in law, declare exclusive fishing zone) |
| | | Community-level monitoring and participatory research with government and other institutions |
| Training and capacity building programmes – skills development | | |

Other important adaptation strategies to deal with environmental variability and climate change included better and safer equipment including GPS, vessel monitoring systems (VMS), access to the Internet, and in cases where certain fish species are only found farther out at sea, larger and more robust

boats. In order to use the equipment effectively, training by relevant government and academic/training institutions is required.

Most case study participants highlighted the need for better infrastructure (road networks, post-harvest cleaning area) and facilities (ice factories, markets) and identified a number of key government agencies that should play a role in providing this kind of practical support. With increasing pressure on coastal areas and fisheries, participants indicated that a need to identify and develop additional income-generating opportunities, and most suggestions were linked to mariculture, aquaculture and tourism. However, there was very little evidence that fishers had actively pursued supplemental and alternative livelihood activities themselves but looked to government to initiate research in these areas.

In some areas, where destructive fishing gear is affecting fisheries resources, fishers support the implementation of government rules and regulations although highlighted the importance of fishers being involved in developing the rules. In Barra do Dande and Cacuaco, where banda banda is still practised, fishers indicated they would like to see enforcement officials play more of an educational role and facilitate learning about the destructive nature of these nets rather than just increased arrests and fines. In Tombwa, the fishers did not regard the beach seines as destructive as they had been in existence since colonial times. In areas, where fishers retain undersized fish, or fish in marine protected areas (MPAs), or harvest restricted species, they explained that hunger and poverty mean they have no option but to harvest these resources. Fishers look to government to assist them in difficult times by providing food (Henties Bay), and said that local government needs to become more involved in developing and supporting additional livelihoods for local fishing communities (Saint Helena Bay, Doringbaai).

Developing and implementing legislation that afforded protection to small-scale fishers and supported their development is necessary for long-term adaptation. The sector needs to be legally recognized (Namibia), with improving mechanisms to protect and support fishers from the industrial sector (Angola and South Africa) and assist them in developing markets. Again, government was identified as the main support partner in this regard. However, facilitating access to credit to enable fishers to deal with and plan for the future in light of change is considered a critical need. This will enable fishers and fishworkers to make their own decisions about how best to deal with change and plan for the future without having to wait for government to intervene. Government need to work with banks and other financial institutions to facilitate access to credit. Strengthening of cooperatives and training of cooperative members to promote a culture of saving and community support is also urgently required.

What emerged clearly from the workshops was the need to further develop these adaption strategies and not leave them as proposals in a report. Fishers highlighted the need for external stakeholders, such as researchers and community development workers, to play a facilitating role in bringing together the relevant government departments and other stakeholders to turn proposals into action plans, ensure validity based on correct information and obtain buy-in. Support from international development and funding agencies would be required to roll out such strategies across fishing communities in the BCLME (see Section 7).

### 6.2 Evaluation of the methodology

The RVA developed for this project offers a quick methodology to: (i) gather socio-ecological information about a particular fisher community; (ii) enhance understanding of the vulnerability of the socio-ecological system with a particular focus on environmental and climate-related changes that may have exacerbated the vulnerability context; and (iii) identify coping mechanisms and adaptation strategies as well as support required to enhance adaptive capacity to address vulnerabilities. During the two-day workshop, the various group and plenary exercises produced data on livelihoods, stressors and vulnerabilities, environmental changes and events that have an impact on fishers' livelihoods and well-being. In addition, participants identified coping mechanisms to deal with these changes and changing circumstances, and how to build on these identified adaptation strategies that work or could be employed to reduce vulnerabilities. This information was strengthened by holding focus group meetings and/or interviews with older fishers after the workshop, where deemed appropriate and where time allowed. Many of the adaptation strategies identified are community-based and, if supported, offer the potential to increase the fishing communities' resilience in general terms but specifically to impacts

associated with environmental variability and climate change. As such, this methodology offers a rapid, participatory and holistic approach that is grounded in the realities of fishing communities from which to develop and implement adaptation plans. It is also relatively easy to apply, and is not resource- and time-intensive.

While the methodology seeks to understand vulnerabilities of the socio-ecological system, and identify challenges and changes facing fishing communities, the two-day workshop only provided time enough to explore the environmental stressors identified on day one. Enhancing understanding of vulnerability in relation to environmental variability and climate change was in fact the focus of the terms of reference of this project. However, in order to gain a better understanding of the linkages across the system in terms of the full range of stressors and changes identified, examination of all stressors would be required. Thus, the RVA could be extended to a third day in order to explore the socio-economic and governance stressors in more detail, as was done with the environmental stressors in this study. However, it may be difficult to persuade fishers to give up three days of their time. Alternatively, a second workshop could be held with a wider range of stakeholders to further explore the range of stressors identified and to confirm and expand on the adaptation strategies identified, with a view to developing concrete proposals for specific actions. Nevertheless, the methodology, as applied, has considerable value in terms of providing a rapid appraisal of socio-economic vulnerability and gaining an understanding of the possible contribution of environmental and climate change to this vulnerability context. It also results in the identification adaptation strategies and support requirements that can inform policies and action. There are certain requirements for conducting a robust RVA as well as certain limitations, which are discussed below:

- Most importantly, the process requires a skilled facilitator and one or two community assistants with some experience of running community assessment processes and who are able to act as translators if required. Ideally, the facilitator should have some knowledge of the system. However, this will not always be possible, in which case working collaboratively with local community development workers or facilitators would be important to ensure the facilitator understands community dynamics, local fishers feel comfortable to speak openly, key information is not overlooked, and local issues are placed in context. Understanding community dynamics and context is important in order to be able to adapt the methodology to the community and individuals' levels of literacy and education. Certain individuals or smaller groups may not feel confident in a workshop environment. In these contexts, space must be provided for these individuals to share their insights and views. This can be done by encouraging them to share their views during the group exercises, or by following up with individual interviews or smaller focus groups after the workshop.
- The facilitators need to be flexible and adjust the workshop programme to address fishers' expectations of the workshop and deal with fatigue, especially towards the end of days one and two. In particular, facilitators need to explain what the value of participating in the workshop could be for the fishers and what follow-up work is anticipated after the workshop.
- Moreover, the facilitator and community assistants must have prior knowledge of the case study community, the fisheries context, the sociocultural values, and the broader governance context. This can be achieved by identifying an in-country small-scale fisheries expert to be part of the team. Developing regional capacity to undertake such local-level participatory workshops should also be explored, as the running of the RVAs improved as the team gained experience with facilitating the exercises. With the project leaders actively working in the small-scale fisheries sector in South Africa, it was easier to gather more in-depth information during the RVAs in these three case studies, as the facilitators had extensive knowledge of the range of ecological and social issues facing these fishers. In the case of Namibia and Angola, while the team members had previously worked in fishing communities in these countries, their knowledge of the socio-ecological and governance context was not as current. Hence, it was necessary to review the grey literature, peer-reviewed articles and other documents (government reports, student theses) relevant to the case under consideration prior to the workshop. An in-country or regional stakeholder workshop that includes representatives from

government, NGOs or other stakeholders can assist in the process of identifying relevant documents, key issues and essential contacts.

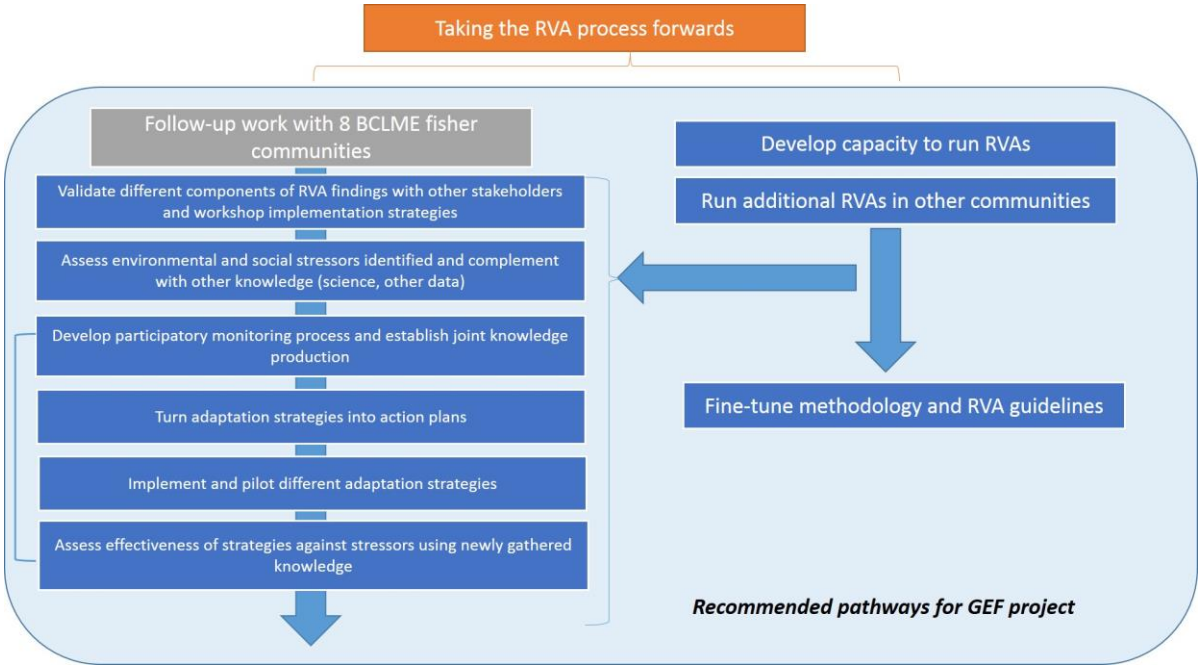
- The RVA was an appropriate tool in communities that had had exposure to and experience working with NGOs or government officials in a workshop situation. However, in Tombwa, the methodology proved very challenging. Workshop participants struggled with the village mapping exercise as well as the ranking of stressors. They felt more at ease in a plenary workshop environment rather than working in groups. The limited educational background of participants as well as their lack of confidence to express their views was in stark contrast to the other case study sites. This meant that the methodology had to be adapted and complemented by more fieldwork, as well as "on-the-go" conversations with fishers at landing sites. Some of the exercises were too abstract; however, when discussing specific questions on species and fisheries, fishers felt more at ease and spoke more freely. In such contexts, it is suggested that the first village mapping exercise could be substituted for a plenary exercise where a facilitator probes the group for key livelihood activities in the community, what resources support livelihoods, key species harvested, who in the community is engaged in the fishery, what institutions play a role, etc.
- A limitation of the RVA process is that not all stressors of the local socio-ecological system may be identified. Key stressors identified will often depend on the participants attending the workshop and what issues are foremost in their thoughts. While the RVA aims to minimize this through linked exercises and group work, the review of available information for the case study site can assist in identifying stressors that may have been overlooked. The facilitator, working with the community assistants, must also be able to assess the reliability of the ranking process of each stressor, and be alert to ranking that may be driven by a few individuals. Where the stressors listed seem incomplete, or the ranking appears skewed, it may be necessary to conduct a further exercise to identify additional stressors for the timeline exercise, as this could elucidate more insights that would be important for examining changes, coping mechanisms and adaptation options. Another option would be to expand the village mapping exercise to include the broader socio-ecological system in which these fisher communities operate. Participants could identify various ecological, socio-economic, cultural and institutional features in which their village operates. This may not be applicable to all case study sites and would depend on the level of participation.
- As the RVA is aimed at understanding people's experience and perceptions of climate change, it is important to know whether participants have had prior exposure to local climate change research or training workshops on this topic. Such exposure may influence the findings, as these communities may have a more sophisticated understanding of the concept of climate change and thus unpack these aspects more thoroughly than communities not exposed to this information. The danger is that the climate change issues gain greater prominence in these communities.
- Last, having a prior relationship with community members (through, for example, prior research or NGO engagement) is extremely beneficial. In all but one of the case studies for this project, at least one team member had worked with some of the fishers in the group prior to the workshop. This prior relationship made the organizational aspects of the workshop much easier, i.e. finding a suitable date when fishers were not out at sea, distributing the invitations, and other logistical aspects such as identifying local caterers.

Overall, participants from each of the seven case studies found the process extremely interesting, useful and empowering, illustrating Preston's (2012) argument for vulnerability assessments to build adaptive capacity if participation is included with due consideration. In certain cases, fishers were able to unpack the fact that fishery-induced changes could influence their perceptions of climatic change and vice versa. In other cases, participants were able to link the cause and effect of various combined stressors on their lives and livelihoods. Moreover, the focus on environmental change allows for a more neutral entry point for a discussion on fisheries issues. Conflict among fishers and different groups (men, women, boat owners, crew, etc.) is prevalent in many fisher communities, especially in the South

African context. In several cases, fishers highlighted the fact that the facilitated RVA process had allowed for difficult issues and conflicts to be raised and discussed in a space that was focusing on issues of common concern. The RVA can thus also be used as a tool for other community assessment and development processes, such as conflict resolution and the development of a community vision and community fishery management plans.

**Figure 25**

**Taking the RVA process forwards**




In conclusion, the RVA can be viewed as a knowledge-generation and community-assessment tool that empowers communities to identify adaptation strategies and embark on an adaptation capacity-building process. At the end of each workshop, participants indicated that they felt more empowered to address change, were equipped with new knowledge about their circumstances, had increased understanding about changes in the fishery, and had clearer ideas about what actions were required to address vulnerabilities and enhance resilience to environmental and other changes. Expectations were high in all case studies that the adaptation strategies identified in this pilot project would be further developed with implementation of the new BCC/GEF project in 2015. The RVAs conducted in this project were intended to be scoping exercises for an upcoming GEF project that would build on information gathered in this process and support implementation of adaptation strategies identified. Depending on time frames, it may be necessary to revisit the adaptation strategies with a broader group of stakeholders to ensure these strategies are still relevant, realistic and broadly supported. However, no clear plan to roll out the GEF project in these seven communities has yet been put in place. Figure 25 outlines a process for taking this RVA work forward in the GEF project. Fishers requested feedback and follow-up, and expressed a desire for longer-term engagement with researchers, NGOs and government through a participatory and bottom-up social learning process. The literature suggests that there is a tension between efficiency and efficacy in public participation. In many cases, effective participation demands more time than a research agenda or funding organization is prepared to allocate. The benefits of inclusive and meaningful participation lead to deeper social learning and community cohesion around issues affecting livelihood adaptation strategies. Therefore, this RVA should be considered as the first phase of a longer-term participatory and social learning process that seeks to reduce vulnerability and develop locally relevant plans to adapt to climate change.

## 7. CONCLUSION AND RECOMMENDATIONS

The application of the community-level RVA in small-scale fisher communities in the BCLME proved to be an empowering exercise for workshop participants. In all cases, except Tombwa in Angola, the methodology worked well and could be implemented as outlined in the methodology (see Chapter 4 and Appendix 1). In Tombwa, however, certain exercises had to be adapted to suit the needs and capacity of local fishers. The study confirmed that the RVA is an effective tool for gathering a significant amount of information on local socio-ecological vulnerabilities in relation to environmental and climate change in a short period of time. Moreover, the various group and plenary exercises allowed for in-depth discussions and reflection among participants and the team of facilitators. Fishers were able to establish linkages between various stressors, explore how they coped with these stressors, and how these coping mechanisms in turn affected individual, household or community-level vulnerabilities. They were also able to identify strategies that seem to be effective in addressing the impacts of environmental and climate change as well as other longer-term adaptation strategies that they considered feasible and sustainable. Although the RVA applied in this project focused mainly on vulnerabilities in relation to environmental and climate changes, events and impacts, it would be ideal to also unpack the social and governance changes in the same way, possibly in a separate workshop as part of a longer-term community engagement and development process.

The participants identified various proposals and adaptation strategies throughout the workshop and especially during the last two exercises. The adaptation options that were identified and the support required to develop and implement them provide a useful starting point for any follow-up process by NGOs, fisheries authorities, local municipalities and the forthcoming BCC Climate Change GEF programme. However, it is important that these adaptation strategies be further developed and refined with fishing communities and a wider group of stakeholders to ensure that there is agreement on: (i) what strategies to focus on; (ii) what support is required from government and other stakeholders; (iii) what capacity development is required within the community to ensure strategies can be implemented; and (iv) what strategies have far-reaching changes that have the potential to uplift communities as a whole while rebuilding often heavily fished resources. As part of this process, a governance analysis should be undertaken of the various fisheries management and development mechanisms as well as of government mandates and programmes. Moreover, it would be useful to gain an understanding of available resources and capacity to develop and implement the identified adaptation actions.

The RVA focuses on gathering qualitative data on the socio-ecological system, i.e. case study community and fishery. This could be complemented with scientific, ecological and fisheries data as well as socio-economic data as part of a longer-term community engagement and empowerment process. Having socio-economic and ecological baseline information of the system would assist in tracking the community's progress towards adaptation and resilience. Community-level monitoring of key socio-economic as well as environmental variables (catches, sea-days, weather, current, temperature, unusual species, etc.) would enhance fishers understanding of environmental changes, and assist in fine-tuning internal adaptation strategies. Cost-effective and user-friendly mobile applications are being developed in South Africa. Moreover, a simple community monitoring programme, implemented at various sites along the coast, could contribute to assessing changes at a more regional scale, and enable comparison of local findings with other research data, and even fine-tune scientific research questions. For example, in Doringbaai, fishers identified a series of changes pertaining to the lobster resource. A regional overview of these observed and perceived changes, through focus group discussions and participatory mapping, involving local fishing communities, could present an important dataset to complement current research and knowledge gaps regarding WCRL distribution and population dynamics.

In places such as Tombwa, where communities are isolated, marginalized and have limited capacity, longer-term participatory processes are needed to develop a local monitoring system and to build local capacity and empower fishers to participate more effectively in workshops and programmes of this nature. A step-by-step community building process is urgently needed, and this could be facilitated by the NGO sector.

Finally, building adaptation to uncertain impacts of climate change, in the context of a small-scale fisher community, is best achieved by enhancing the general resilience of the community. This is especially valid in the coastal communities of the BCLME, a system characterized by high interannual and decadal environmental variability. In many communities, generations of fishers have developed their own mechanisms to cope with the prevalent environmental conditions. However, local institution building could offer one of the best ways to ensure resilient social capital, institutional memory, and a knowledge base that can be transferred to next generations. This can be done practically in all case study sites and other small-scale fisher communities within the BCLME region through: providing support to develop and strengthen local organizations; rebuilding fisheries through local co-management plans and community-monitoring programmes; developing complementary livelihoods in partnership with local NGOs and government agencies; and addressing broad socio-economic rights of fisher communities. All these actions resonate with the recently endorsed Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (FAO, 2015b). Implementing these Guidelines at the national level can thus be considered a good starting place towards building resilient small-scale fishing communities.

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## GLOSSARY OF TERMS

**Adaptation:** The process of adjustment to actual or expected changes and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities.

**Adaptive capacity:** Adaptive capacity is concerned with people's ability to anticipate and respond to changes, and to minimize, cope with and recover from the consequences of change (Adger and Vincent, 2005).

**Climate change:** Climate change refers to a change in the state of the climate that can be identified (e.g. by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. A change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. (IPCC, 2014).

**Exposure:** The presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected (IPCC, 2014).

**Resilience:** The capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation (IPCC, 2014).

**Vulnerability:** The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt (IPCC, 2014).

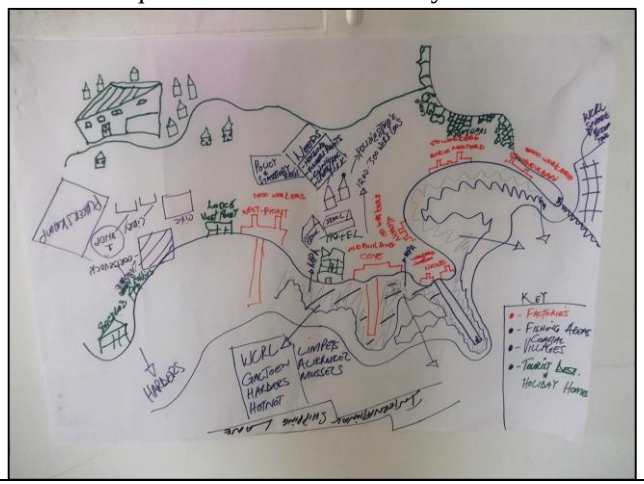
**Appendix 1**

**Rapid vulnerability assessment methodology**

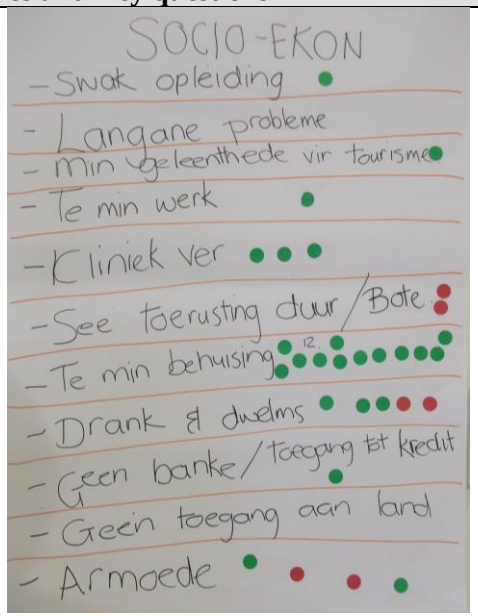
Community - level socio-ecological vulnerability assessment in the Benguela Current Large Marine Ecosystem (BCLME)

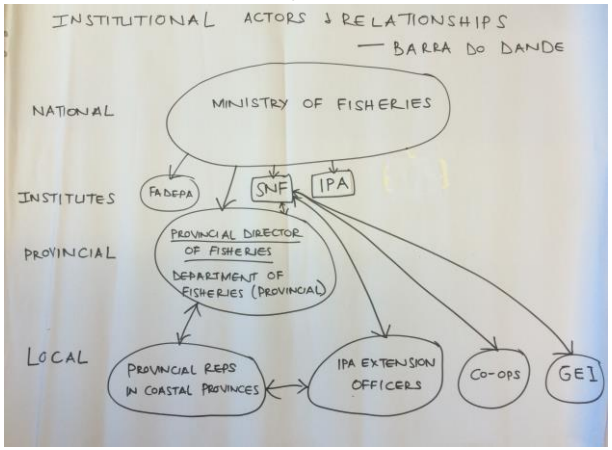
The RVA runs over two and a half days, with the main workshop consisting of eight distinct exercises that are either run in plenary by the facilitator or by dividing the workshop participants into smaller groups with feedback to plenary by an elected rapporteur (See Figure below).

| Day | Time | Activities and Key questions | Possible tools/methods | Note to facilitators |
|---|---|---|---|---|
| **DAY 1** | Max 20 mins | **Welcome and introductions**<br>▪ Presentation: Project overview: context and objectives; explain RVA process and outcomes. Request participant's input on process. Questions of clarity.<br>▪ Team member facilitates process.<br>▪ Ask participants to describe role in/relationship to fishing (e.g. fishers, crew, processors).<br>▪ Discuss participants' expectations.<br>**Objectives for this workshop**:<br>To hear your voices, to learn about your lives and livelihoods as fishing communities, i.e. the threats/stressors that you experience, especially the environmental and climate change threats, the impacts of these stressors on your livelihoods, the strategies you use to cope with change and difficulties and what other strategies and support is required to cope with these threats.<br>**Outcomes:**<br>Identify adaptation strategies, institutional partners and support required to address challenges with a particular focus on climate related challenges. | **Plenary**<br>▪ Attendance register (Table 1) is circulated. (Important to explain that the register is there only to keep a record of who attended but not linked to any government process).<br>▪ Use powerpoint presentation or flipchart paper for project overview and objectives.<br>▪ Use flipchart to identify key activities and objectives for next two days (assisted by student). Paste house rules and objectives on wall. | ▪ Respond to expectations and project intentions for follow-up through GEF project.<br>▪ Agree on house "rules" (no cell phones, respect for one another etc.) |

| Day | Time | Activities and Key questions | Possible tools/methods | Note to facilitators |
|---|---|---|---|---|
| | Max 60 mins | **Exercise 1: Village Mapping Exercise**<br>**1. Map the local Socio-Ecological system**<br>▪ What livelihood assets and attributes enable livelihoods, what are the different livelihoods, where do they take place, what institutions are important etc.<br>▪ What are the strengths and weaknesses and uniqueness of this community<br>  | **Develop VILLAGE MAP**<br>*Group work (groups of 5-7 people) and plenary feedback and discussion*<br>▪ Participants are divided into 2-3 groups. Each small group is asked to draw a map of the village depicting key attributes (assets), groups within the community, key livelihoods and income generating activities, where they take place, and key institutions.<br>▪ Participants given flipchart paper and pens to draw map.<br>▪ Feedback to plenary and discussion regarding omissions, differences among group. | Information generated used to validate and develop a list of livelihoods and a list of institutions (these lists are made by assistant while groups feedback as they will be used for later exercise). |
| | 45 mins | **Exercise 2: Identification of Stressors/Threats**<br>▪ Identify main stressors/threats/challenges/problems linked to their livelihoods (environmental, social, economic, cultural, institutional, political, and at different scales). | **Plenary**<br>*Individual brainstorming feedback on cards, categorizing, and ranking in plenary*<br><br>Each participant gets 6 ‘post-it’/colour cards and is asked to identify 6 key stressors/threats that affect their livelihoods or livelihoods of the community. Three blank flip chart pages with headings are put up on wall: ecological, socio-economic and management/governance. Participants are asked to | ▪ Remind participants to use info generated in activity 1 to help brainstorming threats etc.<br>▪ Explain responses are anonymous.<br>▪ Team assists people who struggle to write down issues. |

| Day | Time | Activities and Key questions | Possible tools/methods | Note to facilitators |
|---|---|---|---|---|
| | |  | try and identify stressors in all categories. An example of a stressor/threat is written on a card and pasted on flipchart under appropriate heading. Participants are given 15 mins for this exercise. Cards are then handed to facilitator for categorization. | |
| | 60 mins or 20 mins | BREAK (lunch or tea) | During tea/lunch facilitators group issues identified according to main themes within the 3 categories. Gaps are also identified for possible further probing. | |
| | 30 mins | **Exercise 3: Ranking Stressors/Threats**<br>▪ Discuss stressors/threats once clustered (20 mins)<br>▪ Identify and add new stressors/threats<br>▪ Rank the main threats/ stressors/problems (environmental, social, economic, cultural, institutional, political, and different scales) | **Plenary**<br>▪ Each stressor/threat is discussed in plenary<br>▪ Men and women get 6 dot stickers (different colour according to gender), which they distribute among the most important stressors | ▪ Assistants help count and rank |

| Day | Time | Activities and Key questions | Possible tools/methods | Note to facilitators |
|---|---|---|---|---|
| | |  | | |
| | 60 mins | **Exercise 4: Identify key events and changes linked to top stressors/threats using a timeline**<br>▪ Identify key events and changes (including environmental events, socio-economic and political changes) that have occurred over past 25 years that have/may have affected livelihoods.<br>▪ Work with six highest ranked issues. | **Group work and plenary feedback**<br>▪ Divide participants into groups – each group focus on 2 key stressors from ranking exercise and prepare Timeline on flipchart paper.<br>▪ If not feasible to work in small groups, divide into 2 groups and select two top stressors/threats | ▪ Suggest participants use red pen for each event or change, and black pen for general observations<br>▪ Suggest fishers think about changes/events pre and post 1990. |
| | 30 mins | **Exercise 5: Map institutional dimensions & relationships**<br>▪ Facilitated discussion on institutions that are relevant/important to livelihoods, discuss their roles and responsibilities, linkages between institutions and the extent to which these | **Plenary exercise and discussion**<br>▪ Use venn diagrams to depict the various institutions.<br>▪ Ask the group which size to use depending on their perceptions of the importance/power of the institution. | ▪ After identifying key institutions and linkages, encourage discussion about key institutional changes that may have |

| Day | Time | Activities and Key questions | Possible tools/methods | Note to facilitators |
|---|---|---|---|---|
| | | institutional changes (may) have addressed or exacerbated stressors/threats identified.<br>  <br> | ▪ Once these are all on flipchart, ask about the linkages between the various institutions and if there is any form of collaboration use arrows to show linkages. | improved or exacerbated problems. |
| | | **END OF DAY 1** | **Plenary: Summarize key activities and outcomes of Day 1. Explain importance of day 2** | |
| | EVENING | TEAM DEBRIEF | Team to discuss proceedings of day 1 and fine-tune activities for day 2 -prepare flipchart tables | |
| **DAY 2** | 15 mins | Summary of key issues emerging from day 1<br>Validation of some key findings | **Plenary** | |

| Day | Time | Activities and Key questions | Possible tools/methods | Note to facilitators |
|---|---|---|---|---|
| | 60 mins | **Exercise 6: Identification of impacts associated with environmental changes**<br>▪ Explore the environmental related events and changes (e.g. increase in water temperature) and impacts on your lives/livelihoods. Discuss how changes have contributed to stressors and vulnerabilities identified the day before and probe for additional ones<br>▪ Consider possible causes of changes identified. | **Plenary using MATRIX (TABLE 2 in Annex)**<br>▪ Use Env stressors/threats identified during day 1 as a checklist.<br>▪ Display Table 2 on flipchart paper.<br>▪ Facilitator provides an example of direct and indirect impact (Show that indirect impacts can be as severe).<br>▪ Refer to checklist in Table 3 to help brainstorm potential environmental climate changes/events (not exhaustive) | ▪ Provide an example e.g. less rain in Touws River area – some farmers switched to game farming<br><br>(The most challenging thing is ascertaining whether participants regard event/change to be linked to env/cc and if so why they say so which requires drilling down on indicators of change – e.g. more winds from SW in which months – less fishing in December and January due to rougher seas etc.) |
| | 15-20 mins | TEA | **List events** | |
| | 45 mins | **Exercise 7: Identify current scoping mechanisms and adaptation strategies**<br>▪ Identify and discuss current coping mechanisms and adaptation strategies to main environmental changes and/or events identified.<br>▪ Are current coping mechanisms effective? | **Plenary and/or group work using MATRIX (TABLE 4)**<br>▪ Divide into groups<br>▪ List key events and changes identified in previous exercise and use Table 4 to guide identification of coping mechanisms. | Facilitator to probe the following:<br>▪ Are the coping mechanisms reactive;<br>▪ Are they designed to reduce risk;<br>▪ Are these useful strategies that are used widely in community or only by a few (which groups etc.). |
| | 40 mins | LUNCH | | |
| | 60 mins | **Exercise 8: Identification of adaptation strategies and support needs** | **Group work/plenary exercise to discuss adaptation options (use Table 5)** | ▪ Draw on the discussion of coping mechanism to guide identification and |

| Day | Time | Activities and Key questions | Possible tools/methods | Note to facilitators |
|---|---|---|---|---|
| | | ▪ Develop and discuss adaptation options, identify obstacles and support needs<br>▪ Identify adaptation needs<br>▪ Identify adaptation options that will address the issues currently faced in communities/ what are options that will enhance adaptive capacity<br>▪ Identify what support is needed and from whom<br>▪ Identify what institutional partnerships and support is required to ensure effectiveness of adaptation strategies? | ▪ Use Matrix (Table 5) to guide identification and discussion of adaptation strategies and needs<br>▪ Refer to questions posed by facilitator to guide discussion | discussion of adaptation strategies that work, others that have potential and consider what support required and from whom. |
| | 30 mins | **8. Wrap-up and way forward**<br>▪ Facilitator provides summary of outcomes of workshop<br>▪ Discussion on usefulness of workshop<br>▪ Discuss follow-up activities<br>▪ Discuss method of feedback of study findings | ▪ Facilitated plenary discussion<br>▪ Note key issues raised by participants on flipchart<br>▪ List follow-up activities | Cover following questions in final session:<br>▪ Was workshop useful?<br>▪ What we will do with information?<br>▪ When/how feedback?<br>▪ What people can start doing at local level now?<br>▪ What institutional partners to approach? |
| | | **CLOSURE** | | |
| **DAY 3** | | **9. Key informant interviews or focus groups** | *Focus groups around key topics*<br>▪ Explore how threats affect # groups –in particular vulnerable groups.<br>▪ Probe key environmental events (or changes observed or perceived) that were identified during the exercises.<br>▪ Explore perceptions of environmental variability/climate change.<br>▪ Discuss adaptation strategies and options and needs to facilitate adaptation. | |

| Day | Time | Activities and Key questions | Possible tools/methods | Note to facilitators |
|---|---|---|---|---|
| | | | *Interviews or qualitative narratives of individual histories and strategies*<br>▪ Hold in-depth interviews or conduct oral histories (whichever appropriate) with older members of community to help plug gaps or enhance understanding of information gleaned at workshop. | |
| | | | | |
| Day x | | Report back of study findings to communities | ▪ Powerpoint presentation and/or verbal report back and use of flipcharts/photographs/diagrams<br>▪ Handout pamphlet with key findings and outcomes | |

**To record by team:**

1. Date and venue of workshop:
2. Number of participants: Male: x  Female: x
3. Language used in workshop:
4. List the different fishing areas, villages or communities included in this workshop (indicate broadly geography region included).
5. Brief description of participants – e.g. type of fishing gears, were they crew members, boat owners, post-harvest workers, women marketers, community leaders. How many from different sectors?
6. Ask participants to identify key people not present at workshop that should be interviewed

**Table 1: Attendance register**

| ***Name*** | ***Man/woman*** | ***Age*** | ***Community*** | ***Signature*** |
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**Table 2: Environmental events/change and impacts**

| Environmental event/change | Direct Impact on? | Indirect impact on? | Low/medium or high impact? L,M,H | What do you think caused the event/these env changes |
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**Table 3: Checklist of possible environmental/ecological stressors and potential impacts on SSF community (Not exhaustive)**

| Event/change/stressor/hazard | Effect/impact |
|---|---|
| **Change in resource abundance (increase or decrease) linked to CC (although very hard to probe)** | **Affect livelihoods, food security, reduced income, loss of jobs, degradation of community, conflict over access to resource** |
| **Change in resource distribution/behaviour linked to CC** | **New species, loss of traditional practice, los of species of cultural significance** |
| **Biodiversity loss** | |
| **Degrading water quality (no fish, toxic fish, etc), acidification** | |
| **Change in sea conditions (storm frequency, winds, water temp, currents)** | **Less catches, reduces safety, difficult harvesting, loss of sea days, affects landing and processing infrastructure, increase production costs, lower profitability, reduced income, loss of livelihood** |
| **Red Tides (increasing/decreasing)** | |
| | |
| | |

**Table 4: Current coping mechanisms and adaptation strategies**

| Key environmental event identified in table 2 | Individual and/or Community Coping mechanism/response or external? | Is it working? |
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**Table 5: Adaptation options, preferences and support needs**

| What strategies are working/could work | What support do you need | Support from whom? |
|---|---|---|
| | **Can be more than one per event** | |
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| | | |
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| | | |
| **ADDITIONAL ONES??** | | |
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