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Research

Failing to plan is planning to fail: lessons learned from a small-scale scenario planning process with marginalized fishers from South Africa's southern Cape

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ABSTRACT. Scenario-planning, a management tool used for addressing challenges in complex and uncertain social-ecological systems (SES), offers a helpful way to facilitate responses to complex change by stakeholders at all scales of the SES. This is facilitated through imagining possible futures in pursuit of a pre-determined and common goal. Environmental variability, together with a failure to recognize the integrated nature of marine SES, are two drivers of change that have contributed to the depletion of ocean resources and stressed fishing communities, including in the southern Benguela system off South Africa's west and south coasts. Here, we present a scenario planning process, informed by transformative scenario planning, conducted with the community of fishers from the town of Melkhoutfontein in the southern Cape region. Together with the fishers, we developed four stories of the future of Melkhoutfontein within the context of an overarching theoretical approach to support the implementation of an ecosystem approach to fisheries management (EAF). These stories incorporate scenarios on key driving forces identified by participants, complemented by key driving forces identified through a related process using problem structuring tools. The stories contrast situations with (no) access to fishing rights and (un-)favorable economics. They are backdropped by two potential future ecosystem types (warm temperate versus subtropical) and knowledge acquired from strategic planning at the national scale. We discuss the insights gained from the scenario-building process, emphasizing lessons learned from this small-scale process with marginalized fishers and how this may contribute to the over-arching scenario-based approach.

Key Words: *adaptive capacity; decision making; ecosystem approaches to fisheries management; marine social-ecological systems; scenario planning; small-scale fisheries*

INTRODUCTION

Scenario planning, a well-established tool used in various applications, can address challenges that arise from the effects of long-term system change, uncertainty, and complexity (e.g., Amer et al. 2013, Jarre et al. 2013, IPCC 2014, IPBES 2016, Maury et al. 2017). Scenario-based approaches offer a helpful way to respond to change by allowing stakeholders to envisage possible futures in pursuing a pre-determined and common goal. Scenarios also provide a valuable alternative to predictions and forecasts, letting stakeholders consider the type of future they want (Haward et al. 2013). In addition, scenario planning stimulates strategic thinking through the process of creating multiple potential futures (Amer et al. 2013). When used as a method of decision support in policy making, the focus is placed on the ideas about the future instead of the actual direction the future may or may not take (Tiller et al. 2013). At the same time, the development process can be helpful to resource users as they are considering permutations of, and possible pathways to, those futures (Daw et al. 2015).

Scenario planning can positively support marine-dependent communities to improve their resilience, particularly given increasing environmental variability and change. Amongst other drivers, environmental variability and change, and a failure to recognize the integrated nature of marine ecosystems have resulted in pressures of overfishing and have contributed to the state of depleted ocean resources, negatively affecting resource-dependent communities globally, including in South Africa (Van Sittert 2002, Ommer et al. 2012, Jarre et al. 2013). This has resulted in marine social-ecological systems (SESs) becoming increasingly vulnerable to uncertainty and change (Perry et al. 2011). Previous research in South Africa's southern Benguela (Gammage et al. 2017a, 2019, Gammage 2019, Martins et al. 2019) described localized drivers of change in the coupled SES from the perspective of southern Cape handline fishers. The research exposed drivers of change and resulting uncertainty. Varying change response strategies implemented by these fishers (coping, reacting, adapting) highlight the effect of increasing variability and ensuing uncertainty in their decision making (Gammage et al. 2017b) while showing how difficult it is to proactively respond to variability and change.

In this paper we present scenario planning stories conducted with the community of fishers from the town of Melkhoutfontein in South Africa's southern Cape region as an initial step in a transformative scenario planning process. This research, conducted at the small scale as a case study, explores a possible tool to support implementing an ecosystem approach to fisheries management in South Africa (Jarre et al. 2018, Gammage and Jarre 2021). It is characterized by an interactive and iterative process that is inductive. This scenario planning component presented a group of marginalized fishers with the chance to engage in a process that was not only important for improving their adaptive capacity but also began to capacitate them to meaningfully engage in more formalized structured decision-making processes in the future (Gammage and Jarre 2020, 2021). In convening a small-scale scenario-planning exercise in Melkhoutfontein, we developed, together with fishers, four stories

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of what the future may hold for Melkhoutfontein's fishing community, considering the impact of four drivers of change: political, economic, (ocean) climatic, and ecological.

The ecosystem approach to fisheries management and participatory scenario planning

Fisheries are widely recognized as part of marine social-ecological systems (e.g., Ostrom 2009). Schoon and van der Leeuw (2015) distinguish three integral aspects of an SES: integrating social and ecological perspectives into a coupled system; the assumption that SESs are dynamic with a high degree of uncertainty; and an inter/transdisciplinary perspective to account for complexity and dynamics. Interactions in SESs evolve in an iterative relationship (Ommer and Team 2007, Park et al. 2012, Binder et al. 2013) with interactions within the system encompassing multiple internal scales (Perry and Ommer 2003, Ommer and Team 2007). In essence, all planetary resources utilized by humans form part of complex SESs comprising multiple, interacting subsystems, including biophysical and social (including cultural) systems (Norberg and Cumming 2008, Ostrom 2009). SESs can self-organize and adapt based on past experiences (Folke 2016) and are characterized by emergent non-linear behavior and stochasticity (Collie et al. 2004, Norberg and Cumming 2008). Described in the context of fisheries, such complex SESs comprise subsystems such as a resource system (e.g., communities of fish); a user system (e.g., communities of fishers); and a governance system (organizations and rules that govern fishing). Importantly, all these elements are separable, but through their interactions, they produce outcomes at the SES level and feed back into one another (Perry and Ommer 2003, Ostrom 2009). SES lenses are widely applied, including in the evaluation of community-based systems such as conflict and collaboration situations, comprising irrigation systems (Hoogesteger 2015, McCord et al. 2017), small scale fisheries (Blythe et al. 2017, Partelow 2018), agriculture, and forestry (Fleischman et al. 2010, Oberlack et al. 2015, Ward 2018).

The ecosystem approach to fisheries (EAF) is a management approach that is fully inclusive of ecological, social, economic, and governance considerations and inherently recognizes the coupled SES with stakeholders in an integrated and adaptive management process (FAO 2003, Stephenson et al. 2021). It is the preferred fisheries management approach to which South Africa ascribed in 2002 (WSSD 2002). In South Africa, the concept of an EAF is espoused in the Marine Living Resources Act (MLRA, No. 18 of 1998), albeit with significant gaps and weaknesses. Although our understanding of the ecological components of the SESs are well developed, it has been more challenging to integrate social components (Shannon et al. 2010, Sowman 2011), but some progress has been made in recent years. However, to implement an EAF, decision makers must balance multiple, often conflicting objectives in a multiple stakeholder context (FAO 1999, Garcia 2000, Degnbol and Jarre 2004, Garcia and Cochrane 2005), highlighting the need for the integration for system-wide multi-scalar decision making.

Implementing an effective EAF remains a challenge: managers need to contend with the inherent complexities of marine social-ecological systems, limited knowledge, and uncertainties in projections, while at the same time identifying and prioritizing management objectives (e.g., Paterson and Petersen 2010, Jennings et al. 2014, Cochrane et al. 2015). Instead of completely changing management approaches, EAF is often treated and implemented as an extension of traditional fisheries management approaches (Berkes 2012). Berkes (2012) suggests a more revolutionary approach is required, considering the multiplicity of challenges and fisheries-associated complexities. This highlights the need to develop and implement multi-user methodologies that can simultaneously address multi-scalar challenges and includes implementing approaches where we build capacity at small scales while potentially informing EAF implementation and sustainable development at larger scales. However, a reinvention of the proverbial wheel is not required; existing methods can also be applied in new ways to address EAF implementation challenges (Gammage et al. 2019, Gammage and Jarre 2020, 2021).

Participative scenario planning (PSP) is solution-oriented and not only aids in increasing adaptive capacity (Kahane and Van Der Heijden 2012, Carlsen et al. 2013) but also in identifying policy recommendations for sustainable development (Bohensky et al. 2011, Palomo et al. 2011) and adaptation pathways (Butler et al. 2014a). In addition, PSP can produce information on how stakeholders may respond to future challenges, contributing to management decision making through a process that also leads to a better understanding of complexity in SESs. Furthermore, PSP can mobilize stakeholders to respond to new threats or opportunities and supports and encourages complex thinking, an essential aspect of resilience (Biggs et al. 2015). Notably, using such approaches, stakeholders as lead users (see Morrison et al. 2004, Jeppesen and Laursen 2009, Ozer 2009) can influence the scenarios and potentially policy in a process characterized by co-design.

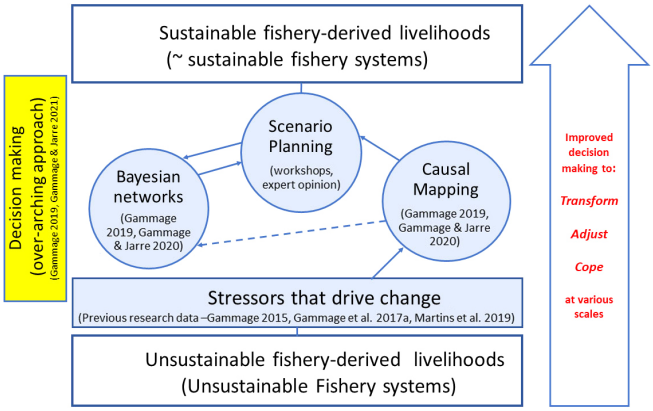
PSP has proven to be a tool that can facilitate the interaction of multiple knowledge systems leading to the co-creation of new understandings of the present while building shared visions of the future (e.g., Daw et al. 2015). This is useful in achieving an improved and holistic understanding of current and possible future system conditions and dynamics at various local, regional and political scales (Butler et al. 2014b). Transformative scenario planning (TSP), a form of PSP, uses backcasting techniques to create normative scenarios that explore possible futures. Normative scenarios are distinctive in the portrayal of the future as "it should be"; they can inform policies by providing images of "landscapes" (system states) that would be able to meet societal goals (Nassauer and Corry 2004). These scenarios start with specific normative starting points and the focus of interest is placed on certain future situations or objectives and how they could be realized/reached. These scenarios are exploratory and speculative (Wiebe et al. 2018) and are designed for all participants (or actors in the system) to work cooperatively and creatively to get a complex problem untangled and moved forward (Kahane 2012).

The motivation to use scenarios in this fishery was borne out of the realization that fishers in the region are generally not well equipped to proactively deal with future change, based on previous research that found fishers' responses to change to be primarily reactive (Gammage 2015, Gammage et al. 2017b). Proactively responding to change is necessary if future livelihoods and well-being of fishers and their communities are to be secured (e.g., Hjerpe and Glaas 2012). This is not only crucial for fishers

but also for long-term ecosystem sustainability. Interconnected challenges of poverty alleviation and ecosystem sustainability span multiple scales and are arguably rooted in how societies understand their world and interact with natural systems (Folke et al. 2011). To achieve sustainability, the transformation of systems at various scales is required (Olsson et al. 2014, Pelling et al. 2015a, Galafassi et al. 2018). To this end, not only is the construction of scenarios a process that can assist fishers in dealing with system uncertainty, it can ultimately be the catalyst for changes in mindset, attitudes, and beliefs at the personal and household scales that are required for system transformation (Folke et al. 2010, Pelling and Manuel-Navarrete 2011, Béné et al. 2012, Pelling et al. 2015b, Armitage et al. 2017).

Drawing on experience from previous research, the requirements for an EAF and the principles of TSP, we developed scenario stories within the context of an over-arching prototype iterative and interactive scenario-based approach using structured decision-making tools (SDMTs; Fig. 1; see Gammage and Jarre 2020, 2021) with marginalized, disenfranchised stakeholders in a small-scale fishery in South Africa's southern Cape. We present and discuss possible futures for developing their hometown, Melkhoutfontein, within the context of key drivers of change identified by the research participants. We also reflect on whether these scenario stories' development helped promote mutual learning as a first, important step toward building adaptive capacity at the small scale and empowering them to participate meaningfully and confidently in larger scale scenario planning and governance processes.

Fig. 1. Graphical overview of the overarching framing and the methods (with references to data sources) as used in this research. To achieve more sustainable livelihoods and more sustainable fishery systems, fishers need to move beyond merely coping with change toward adjusting and transforming their fishery systems at various temporal and spatial scales. Using structured decision-making tools, stakeholders' knowledge of stressors that make them vulnerable to change are used in a layered, iterative, and inductive approach to address the various aims of the research.



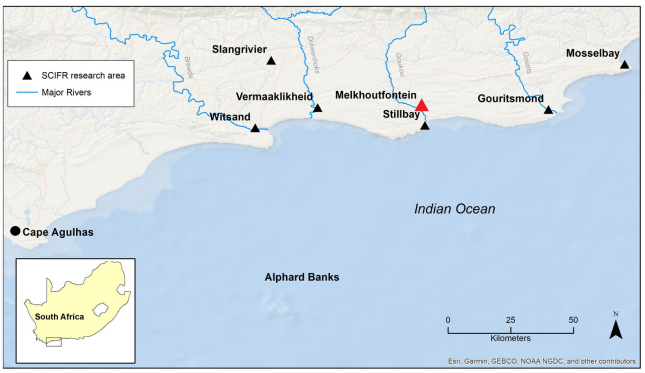
In this process-focused contribution, we describe the case study and the methods used to build the scenario stories and the results from the underlying workshops as they relate to the scenario stories. We present the final stories as results and then discuss what we learned from both the product (the stories) and the process and their contributions in scenario-building approaches as tools for implementing an EAF in South Africa.

METHODS AND APPROACH

A case study in the southern Cape linefishery

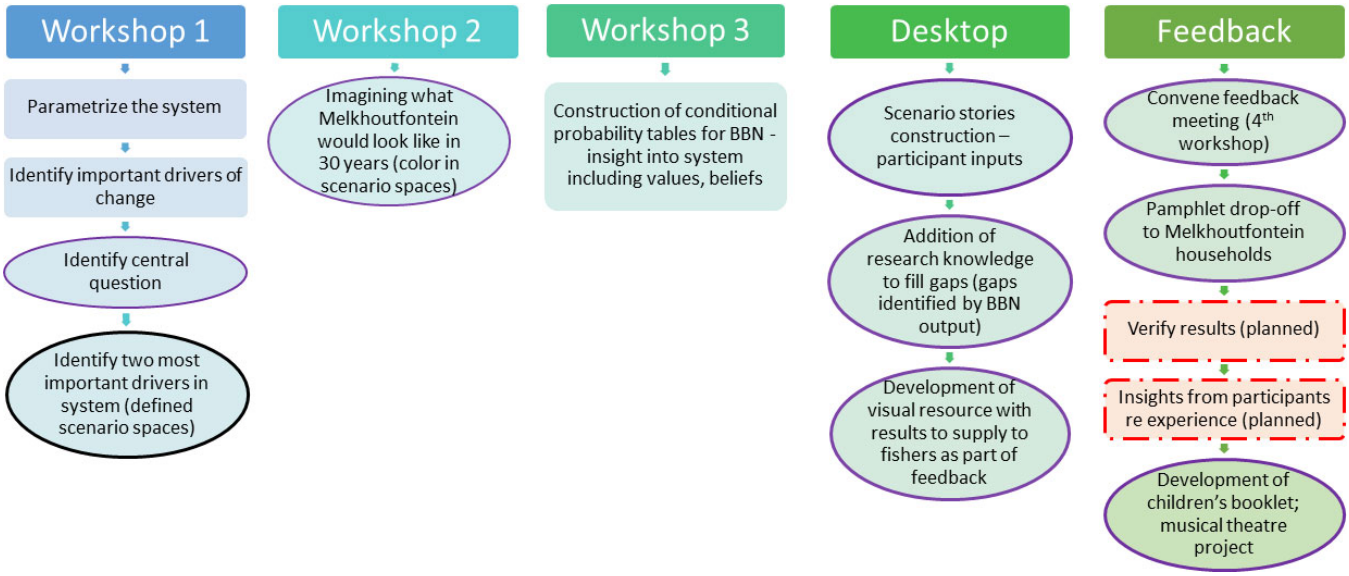
Within the general study area between Mossel Bay and Witsand, we focus on the historically marginalized fisher community of Melkhoutfontein (Fig. 2). These small-scale fishers act as crew[1] in the small-scale commercial linefishery of the southern Cape and are vulnerable to global change (Gammage et al. 2017a, 2019, Martins et al. 2019). However, because of their marginalization under South African Apartheid laws, this group of fishers is characterized by low levels of formal education, elevated poverty levels, and live in a town situated off the coast because of Apartheid spatial planning. Moreover, small-scale fishers remain excluded from formal decision-making processes, often because of their perceived inability to participate (also see Isaacs 2006, Sowman 2006, Sowman et al. 2014).

Fig. 2. Map of the southern Cape (adapted from Gammage 2019).



The southern Cape linefishery operates in the coastal waters in the inshore area of the western Agulhas Bank, located in the southernmost of four sub-(eco)systems of the highly productive Benguela Current Large Marine Ecosystem (BCLME), which sustains important fisheries for Angola, Namibia, and South Africa (Hutchings et al. 2009, BCC 2013). Natural and anthropogenic drivers result in various multi-scalar spatial and temporal changes in the southern Benguela (Jarre et al. 2013, Blamey et al. 2015, Lyttle et al. 2021), making it difficult to establish the exact nature of the resulting stressors and their interactions (Moloney et al. 2013). Determining long-term trends in ocean environmental change is also complicated by inherently high interannual, as well as decadal-scale variability (Blamey et al. 2015, Jarre et al. 2015). However, long-term impacts of climate change are inevitable. They will add to the inherent complexity of this marine SES, posing challenges for both fishery resources and resource users (Jarre et al. 2013, Gammage et al. 2017a, b). This fishery is boat-based, multi-user, multi-area, and multi-species conducting day trips, ranging from six to eight hours. It primarily targets silver kob (*Argyrosomus inodorus*; Griffiths 2000, Blamey et al. 2015); in its absence, silvers/carpenter (*Argyrozona argyrozona*), redfish (like red roman, *Chrysoblephus*

Fig. 3. The scenario development process followed in the Melkhoutfontein prototyping exercise. The causal map and Bayesian belief network development process in Workshops One and Three, delivered their own, separate outputs (detailed in Gammage and Jarre 2020) while informing the final scenario stories. Feedback was initially planned in a fourth workshop that did not take place. Steps pertaining to this component of the research are indicated by oval shapes. BBN = Bayesian belief network.



laticeps), and various species of shark (*Chondrichthyes* spp.) are targeted. It has in recent years been plagued by resource scarcity and increasing variability in the bio-physical system, in addition to the said policy uncertainty (Gammage 2015, Gammage et al. 2017a).

Previous research carried out in the context of the Southern Cape Interdisciplinary Fisheries Research (SCIFR) project (Jarre et al. 2018, SCIFR 2019) described the drivers of change and fishers' responses to the resulting pressures (Gammage et al. 2017a, 2017b). Major stressors comprised policy and regulation, climate variation, and other fishing sectors; mid-range stressors comprise policy enforcement, economics (capital), political issues, and socioeconomic issues. Minor stressors comprise the area's geography, infrastructure, social factors, and lack of knowledge. Although drivers of change are consistent throughout the area, the research showed that more impoverished fishing communities tend to cope and react rather than adapt proactively, with often haphazard decision making (Gammage et al. 2017b). For fishers to develop sustainable livelihoods in the future, these communities will need to respond to change more proactively, engaging in activities that are based on informed decisions (Gammage 2015, Gammage et al. 2017b).

The marginalization of small-scale fisheries and the role of such fisheries in poverty alleviation and food security are well recognized (e.g., FAO 2012, 2016, 2018). In May 2007, the South African government was ordered to provide access to marine resources to disenfranchised traditional small-scale fishers by making regulatory provisions for relief until a formal policy could be put in place. This interim relief policy granted individual temporary rights for a basket of species for subsistence purposes to traditional small-scale fishers (Sowman 2011). Subsequently, the Small-Scale Fisheries Policy (SSFP; Act No. 474 of 2012; DAFF 2012) was promulgated in 2012. This policy grants community-based rights to qualifying traditional small-scale fishers and actively addresses management and regulatory concerns. By adopting a people-centered approach to management, the policy explicitly addresses sustainable development, empowerment, and inequality for small-scale fishers, recognizing the vital role of marine resources in poverty alleviation (Sowman et al. 2014). However, plagued with delays, the policy has, to date, not been fully implemented. This continued failure to grant access to fishery rights is a source of discontent among small-scale fishers. It often prevents them from considering the impact of other pressures on their catches (Gammage et al. 2017a, 2019). At the same time, poorly defined bottom-up management mechanisms limit their involvement in formal management processes.

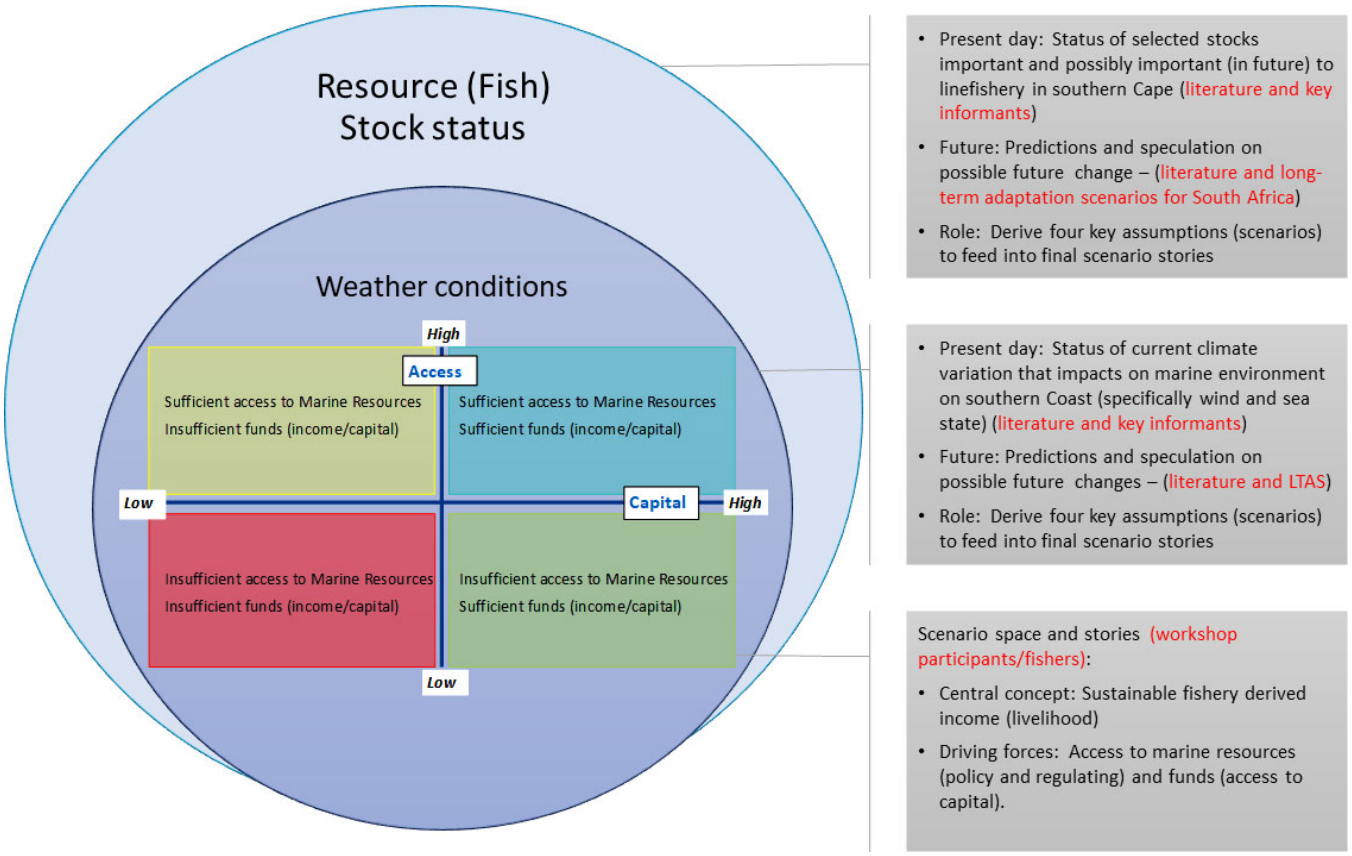
Constructing the scenario stories

Workshops

The scenario-story development took place in conjunction with a Bayesian belief network (BBN) development process (Gammage and Jarre 2020), where three workshops were convened with the fishers from Melkhoutfontein (further referred to as participants). Workshops One and Two directly contributed to the scenario story construction process and are discussed in further detail; Workshop Three was exclusively related to the BBN process and is not relevant here. Before the first workshops, all participants were invited to an informal dinner, which served as a general icebreaker. Figure 3 outlines the various steps in the scenario story construction process.

Although primarily focused on the BBN construction (Gammage and Jarre 2020), the first workshop was an essential first step in the scenario construction process. Here, the day's discussion

Fig. 4. Schematic of the methodology used to derive the final scenario stories. Participant-derived scenarios relating to access to fishing rights and capital were backdropped with additional drivers, i.e., climate change (in the context of prevailing weather conditions) and resource status (in the context of current pervasive fish scarcity in the area and expected distributional changes with climate change). Data sources are highlighted in red. LTAS = long-term adaptation scenarios.



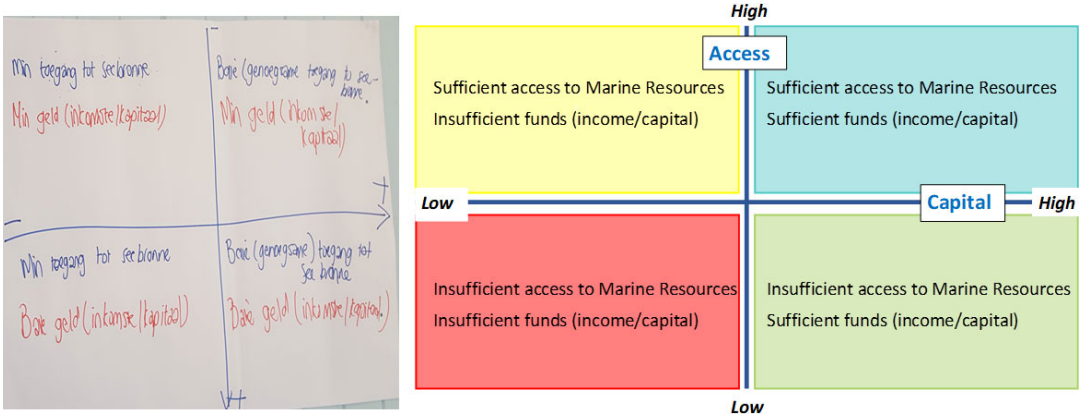
focused on identifying a central theme for both the BBN and the scenarios in defining principal drivers, influencing factors, and a weighted hierarchy. These principal drivers, framed as key driving forces (KDFs), would be central to the scenario stories. Unfortunately, the planned full-day program was shortened because of participants' fatigue, with the workshop ending just after lunch. In addition, various activities planned as part of the program needed to be amended because participants were uncomfortable with some of them. Nevertheless, participants identified their key (central) concept and four KDFs they regarded as central to the central concept for the scenario stories. Next, participants were asked to vote to determine the two KDFs around which they would build the scenario spaces, which were then explored in visioning exercises in Workshop Two.

Workshop Two was a one-day workshop with the same participants. It aimed to construct potential future stories around the scenario spaces created by the two drivers selected in Workshop One (Fig. 4), aiming 30 years—at a bit more than one generation—into the future. As with Workshop One, some adjustments to the pre-planned program were made to ensure that the concept of participant-led and inductive research was upheld. This day also had to be shortened to ensure the participants would stay engaged. Pre-planned exercises such as the building of future Melkhoutfontein using Lego and newspaper headline exercises were replaced with full-group discussions at the request of the participants. This resulted in data that were not as detailed as anticipated. Notably, the planned backcasting exercises, where crucial inflection points or interventions required to realize the future are identified, could not occur. This was due to the participants' struggling with some of the more abstract concepts around the scenario planning process and their reticence to engage with the planned activities designed as part of the backcasting exercise. We partially mitigated this shortcoming by supplementing workshop data with other knowledge: own prior research on stressors, the outcomes from other, pertinent South African scenarios, modelled projections for fisheries and climate, research literature, and expert knowledge.

Desktop work

Figure 4 summarizes the process used to construct the final scenario stories and points to the data sources. In constructing the final scenario stories, the information from the fishers (of Workshop Two) was collated into four broad scenarios. Research knowledge and expert opinion of two KDFs (climate change and changes in resource status) that had not been included in the workshop discussion (see Appendix 1) was added. This was done based on their importance to the functioning of the fishery, as

Fig. 5. Key driving forces (KDFs) identified by participants. Access to marine resources and access to capital (funds) were identified as the two most important driving forces when considering the ability to attain a sustainable fishery-derived income. On the left, the possible scenarios and states are shown as determined in Workshop One, the right panel shows the same drivers and states in English, and on a standard Cartesian plane.



identified by the outcomes of the BBN sensitivity analyses (Gammage and Jarre 2020). Finally, they were synthesized with the fishers' stories to arrive at the final scenario stories.

Feedback to participants and further work

Initially, a fourth "feedback" workshop had been planned to present the completed stories and allow refinement and changes based on participants' inputs. In addition, a short evaluation (anonymous survey) of the usefulness of the tools and overall approach had been planned as an ending to the final workshop. Through this evaluation, we planned to gain insights from participants on their experiences of the process, how they experienced using the tools, what they saw as the benefits and pitfalls, and seek suggestions on how future processes could be improved upon. However, this plan had to be adjusted as fishers were increasingly going to sea as the fishing season had commenced and/or were engaging in alternative livelihood activities. Therefore, in keeping with the inductive nature of the research, it was decided to change the feedback format. The four final stories were included in a pamphlet designed as a feedback resource. The purpose was to present the fishers with the product emanating from the workshopping process whilst presenting an opportunity to further engage and reflect on the workshops and scenarios. The format of the feedback was designed to be informal and took place in one-on-one contact sessions. When fishers were not available, a personally addressed letter with a pamphlet was hand-delivered.

Following this initial feedback to research participants, and given the challenges encountered with the feedback process plus additional challenges imposed by the Covid-2019 pandemic, the scenario stories were also developed into a booklet for middle school (grades 7–9) learners and produced in English and Afrikaans, the principal languages of the schools in the area. The research team partnered with a non-profit artistic company to develop the stories into a musical theatre production. The purpose of the production was to communicate the essence of the stories as told by the fishers while emphasizing the message that the community members have the power to shape their future. Fishers from Melkhoutfontein were again engaged in the script-writing process. The production was first staged in Melkhoutfontein, with a cast that included community actors (A. Jarre and Team, *unpublished data*). The pamphlet and booklet were used as resources for the audiences, who were also invited to provide their immediate feedback (oral or written) to the research team. In this way, the staging of the creative production provided a different format for providing feedback to the fishers, introduced the process to their wider communities, and facilitated further interactions and conversations about the stories.

RESULTS

Because of the iterative nature of the research, the methods and results are very closely related because the unfolding process is a result in itself. Here we present the results in two parts: first, we reflect on the development process (workshop outcomes and some reflections on the workshopping process) before presenting the results as they relate to the product, i.e., the scenario stories.

The process of constructing the stories

In the first workshop, the central theme for the scenario stories was agreed to be to "earn a sustainable fishery-derived livelihood." The four KDFs identified by participants were climate change (variability), changes to the biophysical system, sufficient disposable income, and access to marine resources. The two core KDFs for the scenario stories (determined by an individual, open voting process) were "Disposable income" and "Access to marine resources" (Fig. 5). It was somewhat surprising that the participants settled on these two drivers, given that they had earlier emphasized the role of changes in weather patterns (specifically wind) as a more direct threat to their ability to fish (Gammage 2019, Gammage and Jarre 2020). Ideally, the two core drivers should not be related to each other in any way. However, after much discussion within the workshop setting, these drivers were retained, keeping with the principles of participant-led research.

Table 1. Key elements of each participant-derived scenario space.

Scenario space	Present day: current and potential livelihood activities	Melkhoutfontein in 30 years (in terms of scenario space conditions)	Potential future livelihood activities
Insufficient access to marine resources and insufficient access to financial capital	Housework	Expansion due to government housing projects	Fish traps - tourist attraction, maintenance
	Building (labor)	Fully-fledged town with improved services	Building (labor)
	Reed and wood cutting, land clearing	Little personal capital, but other opportunities than the present	Home bake (including preserves)
	Gardening		Mixed (small-scale) farming
	Working the fish traps		Reed and wood cutting
Sufficient access to marine resources and insufficient access to financial capital	Housework	Although starting with a more hand-to-mouth existence, people could build personal wealth over 30 years	Fish traps - tourist attraction, maintenance
	Building (labor)	More disposable income and job opportunities	Building (labor)
	Reed and wood cutting, land clearing	Expansion due to government housing projects	Home bake (including preserves)
	Gardening	Fully-fledged town with improved services	Mixed (small-scale) farming
	Harvesting marine resources in the intertidal zone	"If there is a vision, you can have wealth"	Reed and wood cutting
	Use social capital and knowledge		
Insufficient access to marine resources and sufficient access to financial capital	Housework	Caring community, more developed town	Sport activities and equipment
	Building (labor)	Attraction for other communities - source of work, more businesses	Various businesses: grass cutting (garden services), boat fixing, selling boat equipment, fishmonger, hairdresser, people carers, expanded mixed farming, job creation, cooking of food
	Reed and wood cutting, land clearing	Increased tourism	
	Gardening	Improved school	
	Working the fish traps	Improved homes	
		Sporting facilities	
Sufficient access to marine resources and sufficient access to financial capital	Housework	Town more urbanized	Various businesses - mostly fishing related (catch fish, buy boat, fish processing, fish tackle, fishing gear, fix boats, increase fishing capacity - better boat, ice), mixed farming, business that supplies carers
	Building (labor)	Improved homes, better services	More training opportunities
	Reed and wood cutting, land clearing	More businesses - business district and fishing businesses	
	Gardening	Attraction for other communities	
	Working the fish traps	Increase in tourism, also fishing tourists	
		Better schooling and training opportunities	
		Little personal capital, but other opportunities than the present	

In the second (visioning) workshop, participants outlined the possibilities for the future of Melkhoutfontein under conditions set by the two core KDFs. Participants were initially reluctant to engage with the process because this was their first experience of a "forward-thinking" approach. Likewise, at the start of the scenario workshop, participants initially did not "dare to dream" because they did not believe they had the agency to bring about changes. Moreover, they appeared uncertain and defaulted to describing their current circumstances but became more comfortable and engaged, increasing confidence as the discussions progressed.

The participants engaged more freely with the more optimistic scenario spaces (notably those where disposable income was not a problem). In the scenario spaces where disposable income was low, there was parity between current and future livelihood activities. Although the development trajectory for infrastructure development in the town was the same for all four scenarios, the pace and scope of the development varied, with the high-income scenarios showing the most significant improvement over the shortest period. Themes/drivers included in the general discussions of the four scenarios include the biophysical environment (fish abundance and climate), other fishery sectors (inshore trawl), policy and regulation (small-scale fishing policy; linefishery), and socioeconomic considerations (local and national economy). Table 1 highlights the key activities undertaken in each scenario, while the complete participant-derived scenario spaces are provided in Appendix 2. Because the backcasting activities did not occur as planned, these stories do not contain any vital inflection points or decisions that need to be integrated into the story's timeline.

As previously noted, the program for both workshops had to be shortened as participants grew fatigued, and it was increasingly difficult to facilitate the workshops as the day progressed. At the same time, it was also a challenge to facilitate the discussions

beyond those "top of mind" issues that often preoccupy this group of participants. The continual changes to the program and planned activities show the importance of being reflexive in one's facilitation approach. At the same time, as with the BBN process (see Gammage and Jarre 2020), the participants did grow more confident and comfortable across the series of workshops, displaying better insight and understanding of the complexity of the issues at hand.

The fishers' scenario stories were subsequently "backdropped" with scenarios regarding fish stock availability and changes as well as general climate predictions (see Fig. 4). The decision to include these two drivers was based on the BBN modeling process, together with discussions within both workshops, where the importance of climate variability and change was highlighted. Participants extensively discussed the impact of resource scarcity, so including the resource drivers was essential. The exclusion of the backcasting resulted in stories that could not function as a roadmap for decision making. However, by including the climate and resource drivers, we could create final stories that serve as a communication tool instead, as demonstrated by the resources developed and subsequent creative production. They also provide the platform for the future development of this PSP process.

The final scenario stories as product

Although there are distinct differences among the scenario stories developed by the participants on the first two dimensions, access to rights and availability of funding, there was also a fair amount of repetition between them, specifically with conditions they felt would not change much (Appendix 2). We then drew on various sources that examine the current system state, including predictions. Finally, the results of other large-scale scenarios, including the long-term adaptation scenarios for South Africa (LTAS), the *Indlulamithi* South African scenarios (http://sascenarios2030.co.za/) and the *Vumalena* land scenarios (https://www.landreformfutures.org/; see Appendix 1) were consulted to add climate and resource drivers to the narratives. This allowed us to create final scenario stories centered on future small-scale fishing in the southern Cape. These four scenarios, "Nothing much has changed,' "We will get there...eventually," 'The going is good,' and "The future is bright," are set 30 years in the future and highlight potential future trajectories for the town under contrasting conditions specified from the main dimensions: political (access to rights), economic (access to financial capital), and environmental (changes in sea surface temperature and ensuing changes in fish assemblages on the Agulhas Bank). These stories outline the end-point state of the town under the various sets of conditions. Figure 6 presents a schematic of the broad "starting point" conditions (see Appendix 3 for the full starting point stories). Figure 7a–d are graphic representations of the key elements of the final stories (Appendix 3).

Feedback to and from participants

Although prescribed by project conditions, there was thus limited opportunity to present feedback within the project's time frame. When meeting with the fishers one-on-one, they did not immediately engage with the material in the pamphlet (see Appendix 4). Instead, they preferred to speak to the researcher about other current issues. Because of the length of the stories, it was expected that they would engage with the stories, reflecting on them, in their own time. Notably, the musical theatre production presented another opportunity to engage with fishers and the broader community on the stories in formal (a workshop, rehearsals) and informal settings (conversations in the wings of rehearsals and performances). Feedback from the audiences was overwhelmingly positive, and it included general appreciation for the effort taken to stage the production in the community and compliments on the realism achieved. Unfortunately, the roll-out to the other fishing communities in the area (see Fig. 2) has been delayed by Covid-19 related lockdowns.

DISCUSSION

These scenario stories have been designed and constructed as part of a prototype over-arching scenario-based approach to change, developed in support of improving the implementation of an EAF in South African fisheries (Gammage 2019, Gammage and Jarre 2021). The use of scenarios has provided insights that emanate from using the tool in terms of the process and the product. We discuss thematically on fostering a systems view, mutual learning, trust-building, and the need for flexibility. We highlight the ability for scenarios to bridge scales, the role of agency and the need to build capacity for it, and the need for proper groundwork to carry out such approaches.

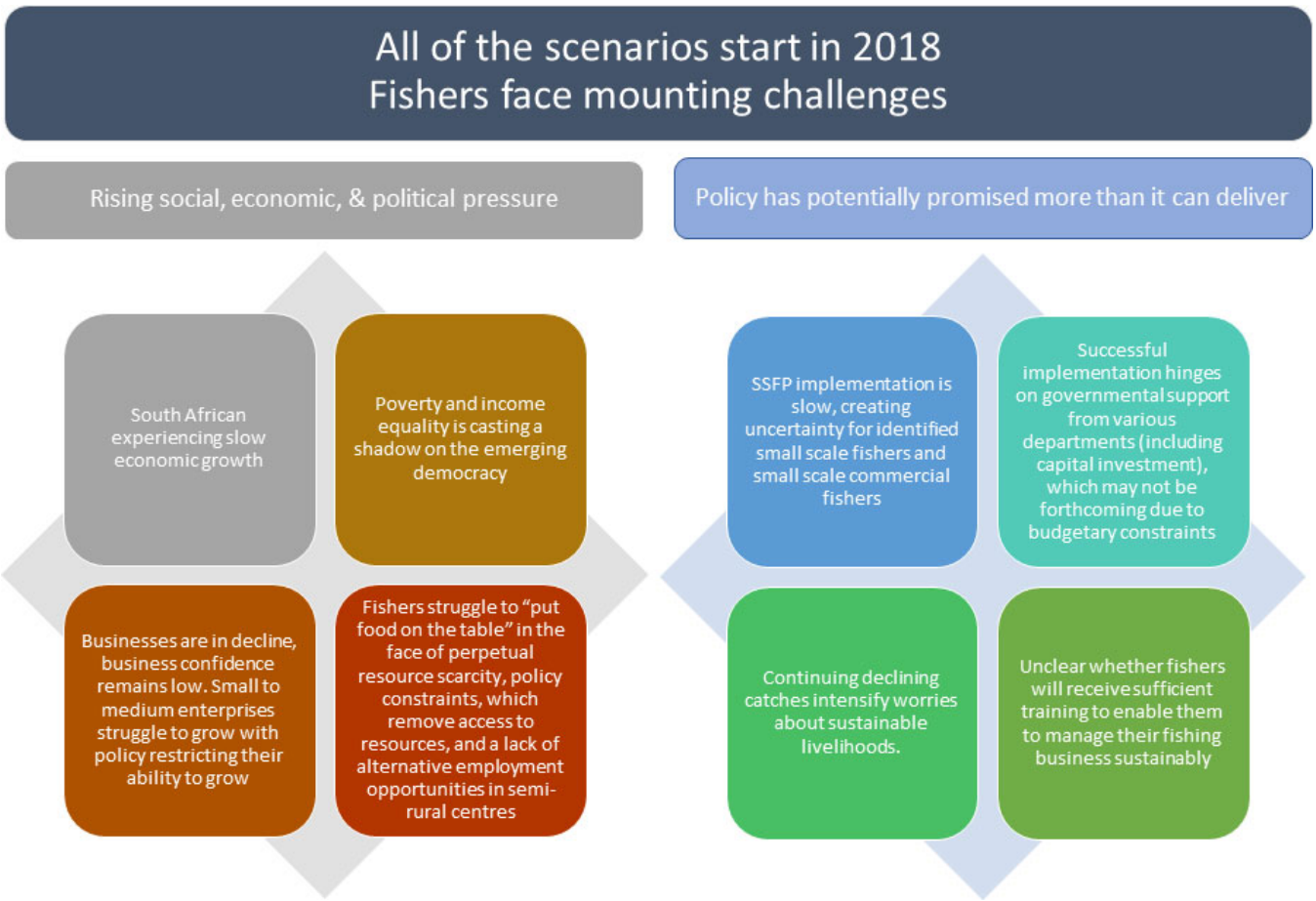
Facilitating the development of social-ecological system views

The final scenario stories are not as all-encompassing as one would want such stories to be. In their discussions, participants tended to focus on the same topics they usually talk about (policy and regulatory challenges), with future solutions very much coupled to these present problems. This led to fisher scenario stories which, while crucial to the process and the construction of the final stories, lacked the level of detail required. This is consistent with findings from related work undertaken as part of the same over-arching scenario-based approach. When comparing the weighted hierarchy and the BBN analysis (Gammage 2019, Gammage and Jarre 2020) it was revealed that although "top of mind" drivers were regarded as the most important drivers in the weighted hierarchy, the same drivers were ranked to be less critical when reframed through the BBN. Notwithstanding the limitation in the fishers' initial stories, the scenario workshopping process created the space for participants to explore and develop more systematic views of their fisheries system. This allowed them to reflect on interactions in the marine SES and the possibilities that the future may hold under different conditions. Considering the consequences of drivers and their interactions woven into understandable, realistic narratives may prompt fishers (and their wider communities) to consider different, less top-of-mind drivers in their understanding of the system and, eventually, decision making

Participatory processes stimulate mutual learning

The most significant value these stories hold is for the fishers of Melkhoutfontein. This is associated with mutual learning that occurs throughout such participatory research processes, a benefit outlined extensively by various authors, including van den Belt (2004), Gregory et al. (2012), and Tuler et al. (2017). They all use perspectives from mutual learning and participatory modeling contexts. Feedback from participants and observations made by the facilitator and research assistants all point to some form of mutual learning having taken place across the series of workshops, also demonstrated with the increasing ease with which participants engaged with the contents. Such facilitated learning

Fig. 6. Starting point conditions (background) information for all the scenario stories. This background information is based on information of the macro system as it stands today from the *Indlumamithi* South African Scenarios (http://sascenarios2030.co.za/), the *Vumelana* land scenarios (https://www.landreformfutures.org/) and previous research into this fishery (Gammage et al. 2017a, b, 2019).



can create a situation/space where knowledge, values, action, and competencies can be developed in harmony to increase the capacity to build resilience to change. Learning amongst peers is believed to facilitate faster and deeper learning when compared to that received by top-down dissemination of information (Pelling et al. 2015a).

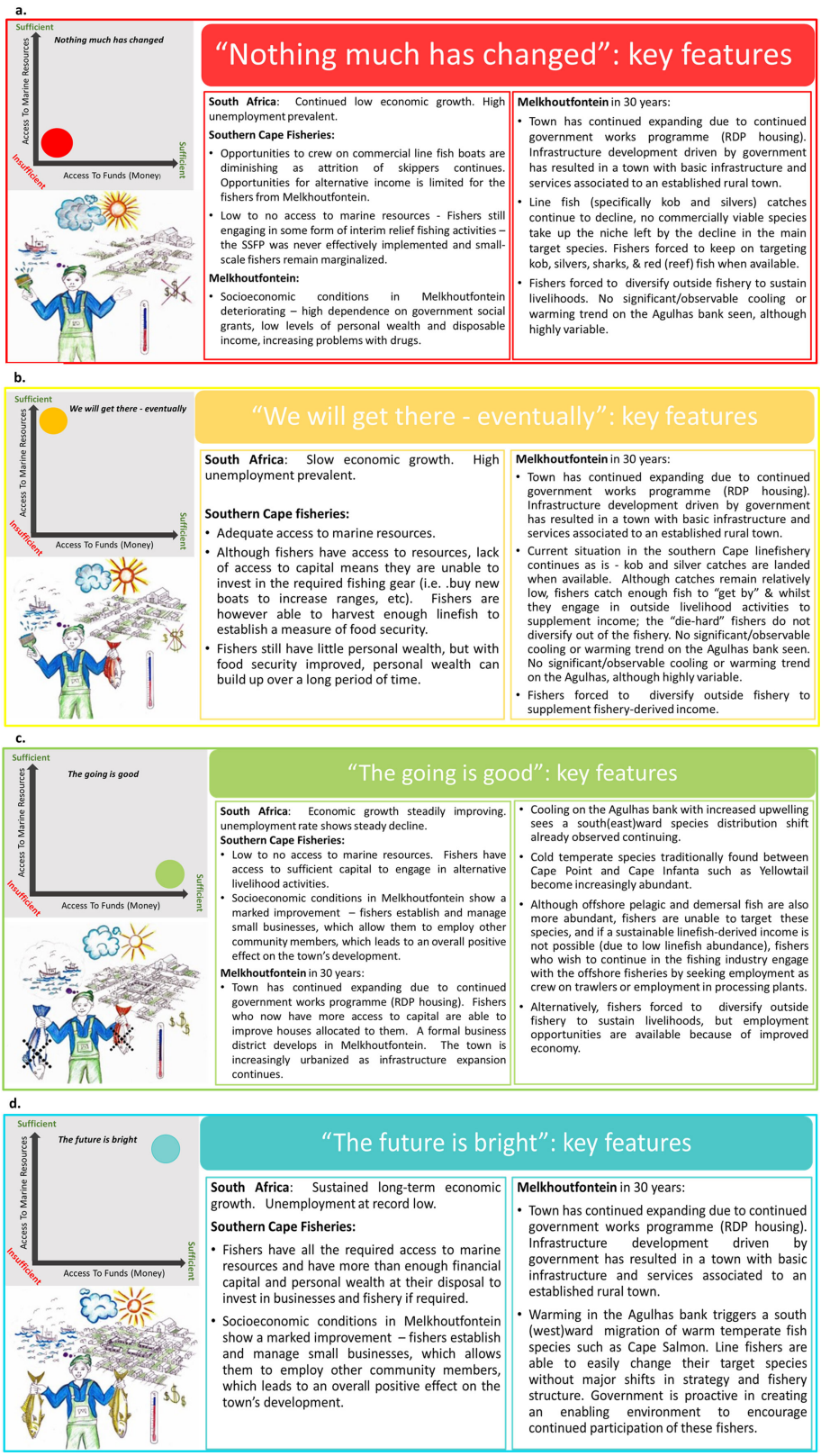
Importantly, this learning should also be viewed as a start to the process of building and fostering agency on a personal or household level. For this group of fishers, being able to engage with each other in a relaxed group setting offered the opportunity to exchange ideas and thoughts with each other in ways they usually are not able to do, either because of time constraints or lack of opportunities ("spaces") to have these discussions.

Scenario planning to build trust

Transformative scenarios are intended to be convened at large scales with a heterogeneous stakeholder group with diverse and opposing views, allowing for common ground to be identified and expanded (Kahane 2012). Therefore, it was valuable and necessary to first convene the scenario at the small scale with a homogenous group. The reason for this was twofold: not only were we testing the use of the tool as part of an overarching scenario-based approach to change management (Gammage and Jarre 2021), but it also created a safe space for these disenfranchised fishers to discuss and grapple with unfamiliar concepts. Should the scenarios have been convened at a larger scale, this group of fishers would highly likely not have had the confidence to voice their opinions on contentious issues. This is due to existing power dynamics within and between fishing sectors (see Isaacs 2006, Sowman 2011, Sowman et al. 2014, Duggan et al. 2020; Sunde 2004, *unpublished report*).

Previous research by Duggan (2012, 2018) documented a high distrust between fishers and the distrust fishers hold of outsiders, specifically scientists and government officials. Such mistrust can hamper collaborative processes, an integral part of any scenario planning (and EAF implementation) process. The approach followed here can help to create the spaces required for incremental trust building. Notably, many participants initially attended the workshops because they recognized the value of the process within the context of implementing the SSFP. At the same time, many leaders in the group recognized the use of the process

Fig. 7. The four final scenarios (a) "Nothing much has changed," (b) "We will get there - eventually," (c) "The going is good," and (d) "The future is bright." The upper-left panel shows the position on the original plane with an artistic depiction of the story in the lower-left panel. The right panel depicts key features of each of the stories.



in exploring ideas for livelihood activities that could also be undertaken in the context of the planned community co-operatives. However, as soon as it became clear that the SSFP implementation was not unfolding as promised by the government, an additional challenge was that fishers steadily grew more cynical, some losing motivation to further engage with the scenario planning. This was specifically evident when trying to prepare the feedback (fourth) workshop.

The need for flexibility and reflexivity in participatory research processes

The participants' difficulty with engaging with the future was further compounded by their unwillingness to engage with techniques/methods designed to stimulate creative thinking about the future (specifically those related to the backcasting, i.e., the Lego building and newspaper headline exercises). In contrast, such techniques were successfully used with similarly disenfranchised stakeholders (for example, the Adaptation at Scale in Semi-Arid Regions project, http://www.assar.uct.ac.za). In our case, to build more vibrant and more complete scenarios, it became necessary to mitigate the resulting lack of detail in the fisher stories by adding predictions and research knowledge to the stories. This underscores the need for flexibility in the planning and implementing workshop programs to ensure participants remain engaged and comfortable. This is not only in keeping with the principles of inductive research (Newing and Contributors 2011) but also because fishers must have the opportunity to influence the participatory research process in a learning setting or process (Muro and Jeffrey 2008).

Reflexivity proved crucial in the process of communicating around the final stories. Providing feedback in the context of participatory approaches is crucial, as highlighted by authors such as Oteros-Rozas et al. (2015) in their review of 23 PSP papers. Providing feedback is also a form of trust-building because fishers appreciate the effort to produce a pamphlet and provide individual feedback. However, providing feedback to participants is often difficult because of practical challenges. Here we diversified the feedback format (face-to-face, the production of reference resources, and a creative production). By diversifying how feedback is provided and using the opportunities presented by social media and other media formats, the communication of research findings among participants and other relevant stakeholders can be improved upon in the future. It does, however, require dedicated effort and resources.

Directly engaging on the final stories in a workshop setting would have provided an opportunity for participants to provide their opinions and further inputs on the stories allowing for further refinements and adjustments. This would also have provided another opportunity to attempt the backcasting and firmly gauge the research process's immediate impact through a survey evaluation. We do not, however, view this as a failure. Instead, it highlights the need to be reflexive and change plans at short notice to ensure that participants remain comfortable in the research process and further support the gradual trust-building that is already taking place. Specifically, we could use existing relationships of trust in staging the musical theatre production. Again, this underlines the necessity of long-term engagement with stakeholders (and the benefits of funding that supports it). Notably, the application of these scenario stories developed here demonstrates the versatility of the tool. Although these stories are a vital component of the overarching approach (Gammage and Jarre 2021), they have value as a stand-alone product.

Notwithstanding the positive outcomes that we have achieved, it remains essential to reflect on how the process could be improved, especially regarding the necessary changes to the workshopping process. Participants were not able to critically review the stories for the reasons provided. As a result, the stories were not refined further, nor was it initially clear whether participants identified with the stories. Not being able to evaluate as planned impeded our ability to measure the impact of using the tools and the over-arching approach. The participant attrition throughout the process may have been due to a lack of investment in the process. Possible approaches to mitigate such challenges include recommending that a diverse, established team of transdisciplinary researchers working in parallel would result in a research process with shorter feedback loops. It would likely be easier to keep the participants engaged, counteracting research fatigue and allowing for faster scaling-up of the process. Importantly, co-design principles should continue to be employed from the onset to create and maximize buy-in whilst ensuring the needs of the participants are considered and met. Taken together with shorter iteration periods, this would likely result in participants who would be more deeply invested in the outcome of the process. Last, a continuous monitoring and reflective/evaluative component should be implemented at every step instead of including it just at the end. The diversity of the feedback (pamphlets, theatre production) we eventually used was effective and provided a platform for further engagements; diversified feedback in such a manner should also be included in the planning of future projects.

Scenarios can contribute to EAF by simultaneous multi-scalar planning processes

The scenario stories' value lies in knowledge co-creation and system view development (Peterson et al. 2003, Oteros-Rozas et al. 2015) and their potential contribution to informing policy and management when carried out at a larger scale (Carpenter et al. 2006, Oteros-Rozas et al. 2015). Scenarios convened at different scales would have different purposes; although able to inform policy processes, larger scale regional scenarios will not deal with fine-scale interactions in the same way that the final scenario stories have been able to do. As such, convening scenario planning exercises at various scales of operation and involving overlapping stakeholders may provide an exciting opportunity to understand better (and eventually address) scale challenges experienced when dealing with change in marine SESs. This is important because there should be a more significant chance of success in addressing such challenges when research/interventions are carried out simultaneously at various scales of operation. This is not a new insight. Authors such as Biggs et al. (2007) provide an extensive overview of methodology that could, in principle, be implemented to deal with multiscale scenario planning. In our case, the multi-scalar role of the scenarios played out within the community. During the development process, individuals engaged with the workshops and stories, while the stories were impactful at the community scale when undertaking the creative production project. The interactive script-writing process also allowed the fishers to provide inputs, reinforcing the iterative process in a multi-scalar (community) setting. These interactions, albeit minor, reinforce the tool's ability to transition between scales and

potentially foster engagement between scales. Gammage and Jarre (2021) further explore how a multi-scalar scenario-based management approach, which makes use of scenario stories as a tool, could be used to promote EAF implementation.

Policy frameworks are not enough: disenfranchised communities need support to foster the agency and capacity communities need

When considering the possible pathways for responding to future change and the demands set by the EAF for bottom-up, interactive management of fisheries, it is necessary to consider the role of capacity building and agency in the practical implementation of such strategies. For marginalized small-scale fishers, it may remain difficult to bring about the required shift in thinking without outside support. Therefore, other parallel, often policy-driven processes, need to occur to develop adaptive capacity and build agency within disenfranchised (South African) communities. An example of this is the SSFP: although the SSFP removes a significant barrier regarding access to resources, without added support from government departments such as the South African Department of Forestry, Fisheries and the Environment and non-governmental organizations (NGOs), fishers will struggle to capitalize on opportunities. In our case study, these fishers lack the resources to bring about change themselves, also demonstrated by the responses to change within the community (see Gammage 2015 and Gammage et al. 2017a). Here, a lack of agency, associated with the socioeconomic conditions the fishers find themselves in, is aggravated by low formal education (Duggan et al. 2021).

For any grassroots "social movement" to succeed, a sufficient base of motivation, human resources, solidarity networks, and (often) external agitators are required (Ballard et al. 2005). Considering the general lack of adaptive capacity and agency within the southern Cape linefishery (Gammage et al. 2017b), strategic future planning may only become viable if external agitators (which include champions within the state and key NGOs who have networks and resources to draw on) are willing and able to actively move the processes of capacity building and planning along.

Scenario development processes can play a vital role in the development of agency in communities. It was apparent that there was a disconnect between what fishers believed they could do and what the process requested of them. However, as the process advanced, the participants became more engaged with the concept of future casting, and there was enthusiastic engagement with future business ideas and possibilities. To foster agency, community developers/facilitators who work with communities over the long term must plant the seeds and guide them toward making changes in their communities (Pereira et al. 2018a, b); the scenario stories here have been demonstrated to be a stepping stone.

Proper "groundwork" must be done before multi-stakeholder decision-making processes can take place

Last, for diverse stakeholders in the fisheries of an SES to get to the point where they are willing to engage in larger scale decision-making processes such as transformative scenario planning, a significant amount of groundwork must be completed before the actual workshopping takes place. Although in the general context of EAF implementation and not explicitly referring to scenario planning, Paterson and Petersen (2010) and McGregor et al. (2016) emphasize the importance of carrying out the proper groundwork in multi-stakeholder processes in Benguela fisheries. This groundwork involves articulating the problem (or theme), mapping the system stakeholders and enrolling a diverse and representative team of people from across the systems who want to and can influence the system's future (Kahane and Van Der Heijden 2012). Should this scenario-planning process be scaled up to include, for example, all small-scale fishers in the southern Cape, a significant amount of time and resources will have to be spent on laying the required groundwork. Getting buy-in from decision makers will be the most challenging aspect. This is especially true for government, where political will and sufficient management capacity are essential to bringing about change by creating a favorable governance and management environment that favors implementing and using approaches such as scenario planning. In the context of a weak state, other stakeholders such as fishers themselves, NGOs, and other actors have started to formulate and implement proactive, adaptive strategies within the realm of current South African legislation to develop marginalized coastal communities on a path toward improved resilience.

CONCLUSION

The scenario-planning process strived to highlight possible pathways for the potential development of Melkhoutfontein by using an iterative and participatory research approach while at the same time building capacity among disenfranchised fishers. The stories co-developed here represent scenarios on key driving forces identified by participants, complemented by driving forces identified through a related process using problem structuring tools from decision science, demonstrating the value of incorporating such tools in a scenario planning process. Promoting learning and capacity building is essential to individuals' adaptive capacity and building capacity to engage in larger scale scenario planning processes meaningfully. Although it is always difficult to formally evaluate mutual learning, the development of some skills and learning was evident when considering the engagements with the participants throughout the workshopping process. Through engaging with the feedback resources and a creative production, fishers were presented with another opportunity to reflect on their experience of the process. Importantly, developing the scenarios in this iterative and interactive process has presented the small-scale fishers of Melkhoutfontein with a unique opportunity to engage with challenging (and often emotive) concepts related to the town's future and their and their families' potential future pathways. It moved them from a state of "merely coping" into space where they dared to dream. The research presented here has demonstrated the value of engaging these disenfranchised fishers in planning for a complex and highly uncertain future. The realism and community-oriented results in the form of stories provide the basis for a new, larger scale multi-stakeholder process. Given the marginalization of handline fishers and the high level of conflict, the next step should scale up in the same biogeographical region, but stepwise, including more stakeholders from this fishery before branching out to other fisheries sectors.

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[1]Although most of the fishers currently act as crew on line fish boats, many of these fishers have been identified as small-scale

fishers who will benefit from a community right that will be allocated under the Small Scale Fisheries Policy (SSFP, Act No 474 of 2012; Sowman 2011, DAFF 2012). Some of the fishers have in the past been holders of "Interim Relief" permits that were first granted in 2009 pending the finalization of the SSFP and its implementation.

Responses to this article can be read online at:
https://www.ecologyandsociety.org/issues/responses.php/12886

Author Contributions:

LCG conceptualized the research, carried out the fieldwork, and authored the paper, which formed part of her PhD research. AJ was the primary supervisor of the research, while CM was the co-supervisor. All authors contributed to the article and approved the submission.

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Data Availability:

The study involving human participants was reviewed and approved by the University of Cape Town - Faculty of Science Research Ethics Committee (FSREC 03 - 2016). The participants provided informed consent to participate in this study in writing. The datasets generated for this study cannot be publicly available because of restrictions imposed by ethics requirements and agreements with research participants [providing such data would compromise the participants]. Selected data that does not breach any ethics requirements are available on request from the corresponding author [LCG].

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Appendix 1: Additional background for Scenarios

Changes in weather patterns in the southern Cape

While fishers often attribute the current and pervasive failures of kob catches on drivers like policy and regulation, lack of funds (capital) and the impacts of the inshore trawl fishery in the area, the underlying cause appears to be kob scarcity. These shortages are most likely due to a combination of anthropogenic climate change and fishery impacts (specifically historical over-exploitation) which place severe pressure on the southern Benguela, including the distributions of marine species (Blamey et al. 2015, Currie 2017, Currie et al. 2020). Discussions with fishers throughout the workshopping process highlight the importance of weather on their ability to proceed to sea. Fishers specifically note a change to long-established weather patterns, especially when considering wind and sea current (Ward 2018, Lyttle 2019). Gammage & Jarre (in review) show that although some drivers (like climate variability and change) are not always 'top of mind', it does not mean that the effect of those drivers is not felt and that they do not exist. The BBN outputs (see Gammage 2019, Gammage and Jarre 2020) highlight the importance of climate drivers in this fishery system.

Status of climate variability/change in South Africa and the southern Cape

South Africa's climate is regulated by the ocean on three sides of the country. The southern coast is warm-temperate with varying rainfall regimes that include summer, winter and bimodal peaks in rainfall (DEA 2013). For South Africa, the mean annual temperature in South Africa has risen at least 1.5 times more than the observed global average of 0.65˚C between 1960 and 2010. Although an overall increase in the frequency of extreme rainfall events has occurred over the same period (Ziervogel et al. 2014) with LTAS model outputs indicating a significant increase in future flood risk (DEA 2013); trends in rainfall indices show a decrease in the number of rain days which could indicate a drying trend (MacKellar et al. 2014). Recent research into rainfall and temperature trends in the southern Cape by Ward (2018) found no clear trends in time for changes in rainfall amounts, although high variability has been noted. However, farmers interviewed have indicated that while the amount of rain has not changed significantly, the rainfall patterns have changed over time. The coastal temperature in the area displays more variability than that interior temperatures. There were more prevalent outliers for warmer temperatures, particularly in austral winter. These observed trends are consistent with longer-term predictions for the Western Cape, where hotter, drier conditions are expected as climate change advances (MacKellar et al. 2014).

Climate and the marine environment

The South African coastline, one of the most naturally variable globally, is approximately 3000 km long and incorporates ecoregions ranging from cool-temperate on the west coast, warm-temperate on the south coast, to subtropical on the east coast (Mead et al. 2013). The continental shelf widens west of East London and east of Cape Point to form the roughly triangular Agulhas bank, which extends about 250 km (135 nm) off the coast of Cape Infanta (Gammage et al. 2017). Spatial and temporal changes in the Southern Benguela ecosystem are attributed to various natural and anthropogenic drivers in the system, such as biotic processes, changes in structural habitat, climate change and fishing (Blamey et al. 2015)

The research area and coupled fishing activities of fishers are found in the inshore of part of the Agulhas Bank. The hydrology of the Agulhas bank is primarily driven by the wind regime, the Agulhas current running along the shelf break, and seasonal overturn of shelf waters (Jarre et al. 2015). Analysis by Rouault et al. (2009) indicates a strengthening of the Agulhas current's flow over the past 25 years, which results in warmer offshore water. Rouault et al. (2010) confirmed offshore warming and inshore cooling, corroborating findings by Roy et al. (2007). However, Blamey et al. (2015) indicate a consistent warming

trend across all seasons, with general warming most distinctive in the early southern hemisphere summer months. There is more disagreement between signals of different datasets for the Agulhas Bank than for the other subsystems of the Benguela (Jarre et al. 2015). The exact interplay and trends concerning sea temperature are difficult to determine for the greater Agulhas Bank (Lyttle 2018; Ward 2018).

Two distinct ecosystem regime shifts, the 1960s and mid-1990s/early 2000s have been identified and verified (Howard et al. 2007, Blamey et al. 2012), with Ward (2018) finding evidence of a potential third in the more recent analysis. Research into historical and prevailing wind regimes at the scale of the southern Cape has shown no significant and discernible trends at the small scale (nearshore) (Ward 2018), and thus accurate future predictions are problematic. However, Ward (2018) finds that offshore wind drivers show more evident trends of increased wind speeds overtime at the shelf scale. Lyttle (2019) show that this trend of increase in offshore winds influences swell, which results in increased in wave heights on the inshore scale of the southern Cape, although both these analyses are dependent on National Centre for Environmental Prediction (NCEP) wind data.

Changes in the fishery system

Fishers identified changes in the biophysical systems as one of the four KDFs in their system. As this system is currently operating in a state of resource scarcity (Gammage and Martins unpublished data, Duggan 2012, Gammage 2015, Currie 2017, Gammage et al. 2017, Martins et al. 2019), the focus of the biophysical KDF for the final scenario story will be placed on the current and potential future status of fishery resources in this area.

Status of fishery resources in the southern Cape: present day

Climate change and variability have direct and indirect impacts on marine resources. Direct impacts include changes in physiology (specifically growth and reproductive capacity), mortality, distribution and behaviour. Changes in productivity, structure, and composition of the marine ecosystems on which fish are dependent for food are indirect impacts. Fishing effort, biological interactions, and non-climatic environmental factors may also have similar effects (Brander 2010, Hollowed et al. 2013).

Changes in species abundance and distribution are mechanisms by which fisheries resources in an area can change over time. It has, to date, been difficult to determine linefish stock levels in South Africa accurately, but particularly at the scale at which the linefishery in the southern Cape operate (see Blamey et al. 2015). However, for this scenario exercise, we can assume some changes on the small-scale, based on larger-scale change provided by previous research in the southern Benguela and Agulhas bank to establish potential future systems states (notably Blamey et al. 2015). Thus, it is only necessary to ascertain what changes fish stocks may undergo in the broadest term for these scenarios. A synthesis of ecosystem change seen in the southern Benguela by Blamey et al. (2015) describe changes seen in the southern Benguela ecosystem, whilst Currie (2017) provides a comparison of historical baseline data from the demersal trawl fishery on the Agulhas bank to a data from a resurvey in three locations (Cape Infanta, Mossel Bay and Bird Island). Currie's research provides valuable insights into how fish assemblages in some species key to the linefishery in the area have changed regarding species abundance and distribution over the past 100 years and allow us to speculate on potential future trends (in the broadest terms).

Changes in the distribution of crucial fish species on the Agulhas bank

Changes in marine distributions for the southern Benguela are well-documented. However, most of the knowledge of the physical and ecosystem change stems from the west coast of South Africa, resulting in a poor understanding of the system dynamics on the Agulhas Bank, particularly at small, localized scales (Blamey et al. 2015, Watermeyer et al. 2016, Currie 2017). One of the most important distribution shifts

seen in the southern Benguela is the southward and eastward shift in distribution from the west coast to the Agulhas bank of Sardine (*Sardinops sagax*) and Anchovy (*Engraulis encrasicolus)* (der Lingen et al. 2002, Fairweather et al. 2006). As sardine and anchovy are important prey fish, it is thought that this shift may have impacted other ecosystem parts, including the distribution or abundance of fish and squid. Watermeyer et al. (2016) found evidence of increased catch proportions of amongst others, squid (*Loligo reynaudii*); kingklip (*Genypterus capensis),* round herring (*Etrumeus whiteheadi*) and chub mackerel (*Scomber japonicus*) east of 20°E (east of Cape Agulhas) following the documented shifts in sardine and anchovy distribution. Other significant eastward distributional shifts noted include west coast rock lobster (*Jasus lalandii*) (Blamey et al. 2012) and the eastward range expansion of kelp (*Ecklonia maxima)* (Bolton et al. 2012).

Changes in abundance of key fish species on the Agulhas bank

The analysis by Currie (2017) includes changes in abundance for fish species found on the Agulhas Bank. Specifically, declines in the kob abundance seen in the area are severe. Whereas kob catches in trawls were dominant (up to 25% of the catch) in the 1903/1904 baseline, they were absent in the repeat surveys of 2015. This evidence supports other studies (Griffiths 1997, 2000) and fishers' accounts (Gammage 2015, Gammage et al. 2017, Martins et al. 2019). In addition, Currie (2017) shows a substantial decrease in the kob catches in the inshore trawl in the first half of the 20th century, likely indicative of early fishing pressure and resulted in removing a sizable proportion of the pre-disturbed populations of kob (Currie 2017). This, coupled with more significant pressure in the mid-1960s and early 1980s, has likely contributed to the severe depletion of stocks experienced in the present time. Other commercially exploitable species from the area which show declining abundance include silvers/carpenter, which was found to be 0.1% of historical abundance and white stumpnose, which was found to be at 0.1% of historical abundance (Currie 2017).

At the same time, the same comparative work carried out by Currie (2017) has noted an increase in abundance in, among others, gurnards (*Chelidonichthys spp.)* and horse mackerel (*Trachurus capensis)*. However, these species present little opportunity to the linefishery in its current format. Currie (2017)'s research was carried in the context of inshore trawl and did not necessarily overlap with the linefishery in the same area. The conflict between these fisheries is well-documented, and line fishers accuse inshore trawl of increasingly encroaching on their fishing grounds. Due to the interconnectedness of the habitats in the southern Cape/Agulhas bank ecosystem, we can assume that ecological niche replacement has taken place in the inshore part of the ecosystem.

Fishery resources in the southern Cape: potential futures

The most significant drivers of change in this marine ecosystem will likely be fishing pressure and the effects of large-scale, long-term climate variability and change. While the examples of distributions shift and changes in abundance highlighted above are by no means exhaustive, it illustrates the current state of system flux and underscores the problem of resource scarcity regularly highlighted by fishers. Regarding fishing pressure on inshore marine species, even though inshore trawl effort has significantly declined in recent years, the after-effects of long-term trawling may have resulted in irreversible damage to traditional stocks. Historical, long-term trawling on the Agulhas bank has likely led to a reduction in habitat complexity. Modified energy flow pathways would benefit specific taxa but negatively affect others. Taxa that have declined on the Agulhas bank are associated with reef habitats, while species displaying an increase in abundance prefer soft substrates or inhabit both hard and soft benthic substances (Currie 2017). The survey sites used by Currie (2017) have remained commercial trawling grounds since the initial historical surveys took place. Thus, reef-like habitats, consolidated substrates structure forming communities that may have been present historically, have likely been removed or degraded by trawling. This seems to have promoted a change from partially-reef associated assemblages to catch compositions

dominated by taxa associated with unconsolidated benthic habitats. This support the belief that extensive trawl activity on the inshore trawl grounds bank has modified benthic habitats. If this is correct and the sediment structure has been modified by trawling, the benthic habitat and the fishing community dependent on it may be permanently altered and fail to recover even if fishing were stopped (Currie 2017).

However, it remains challenging to predict marine ecosystem and fisheries responses to climate change accurately. Complex species distribution relationships, variation in abundance, the impact of overfishing couples with other system stressors create knowledge gaps that are difficult to circumvent. As a result, effective modelling is limited by incomplete information on the functioning of biological resources and the physical changes in the oceans. Moreover, there is also much uncertainty about the future impacts of climate change, specifically at local scales such as the southern Cape (Ortega-Cisneros et al. 2017, 2018).

As described, several marine species have already shifted their geographic ranges. Regarding fish species' general response to warming, a (south) westward migration of warm temperate species such as Geelbek (or Cape salmon) (*Atractoscion aequidens*) could occur. The temperate regions may also contract, with south coast species potentially affected by increased upwelling, related temperature extremes, reduction in runoff, and habitat loss, resulting in a decrease in subtropical species diversity and abundance. Extreme rainfall and dry spells, together with sea-level rise, could result in the loss of nursery habitats. The positive impacts of increased rainfall could be offset by seasonal shifts that may confuse behavioral cues at critical life-history stages such as spawning and migration. For example, changes in freshwater flow, sea surface temperature, and turbidity may impact the squid fishery and endemic subtropical linefish such as white Steenbras (*Lithognathus lithognathus*).

For the Agulhas bank, if populations are pressured to move due to anthropogenic warming, some of these populations may be facing a dead end. If the bank were to experience a net-warming effect, cooler-water species could move towards and into the upwelling ecosystem of the west coast, where cool shelf and inshore waters might be maintained (Lamont et al. 2018). It is, however, likely that if the highly productive west-coast subsystem suits their habitat requirements, they already occur there. The southern edge of the Agulhas Bank together will serve to limit the possible poleward expansion of demersal and pelagic species and could signify a potential dead-end if changing environments force species to migrate southward (e.g. Currie 2017). However, warm temperate species which could migrate south (east)ward due to warming could fill the niche created by the loss of the colder water species, presenting line fishers with alternative commercially exploitable species which would not necessarily necessitate a drastic shift in fishery or strategy (Blamey et al. 2015).

In another scenario, the bottom waters of the Agulhas Bank may cool due to an increase in coastal upwelling (Lamont et al. 2018) and/or greater shelf-edge upwelling, which we would expect to be driven by variability of the Agulhas Current (Rouault et al. 2009, Beal and Elipot 2016). The likely impact would be on the cold eastern ridge; (Swart and Largier 1987, Lutjeharms et al. 2000) and inshore parts of the bank through increased coastal upwelling. Species wishing to avoid the colder waters may move further east towards the warmer bottom waters found near the slightly warmer inshore areas between Mossel Bay and Cape Agulhas. This area is narrow compared to the greater (but cooler) Agulhas Bank and suggests that these distribution changes could reduce the geographic spread of the population. Furthermore, the increase in upwelling would likely increase productivity in certain areas, which would cause further changes in the ecosystem. Along with the cooling trend, there would be potential for species such as yellowtail (*Seriola lalandii*) to migrate eastward into the fishing grounds of the southern Cape linefishery (Blamey et al. 2015), offering a potentially viable alternate linefish species to target.

Summary of scenarios derived from additional drivers

Figure A2.1 shows four possible scenarios based on current and potential changes in species distribution and abundance patterns on the Agulhas Bank. Climatic drivers have already been incorporated in that that fish stocks could respond to the warming/cooling of the Agulhas Bank. Conversely, warming or cooling seen in the Agulhas bank will likely be a function of larger-scale climate changes. Thus it becomes unnecessary to take specific climatic drivers into account for these scenarios.

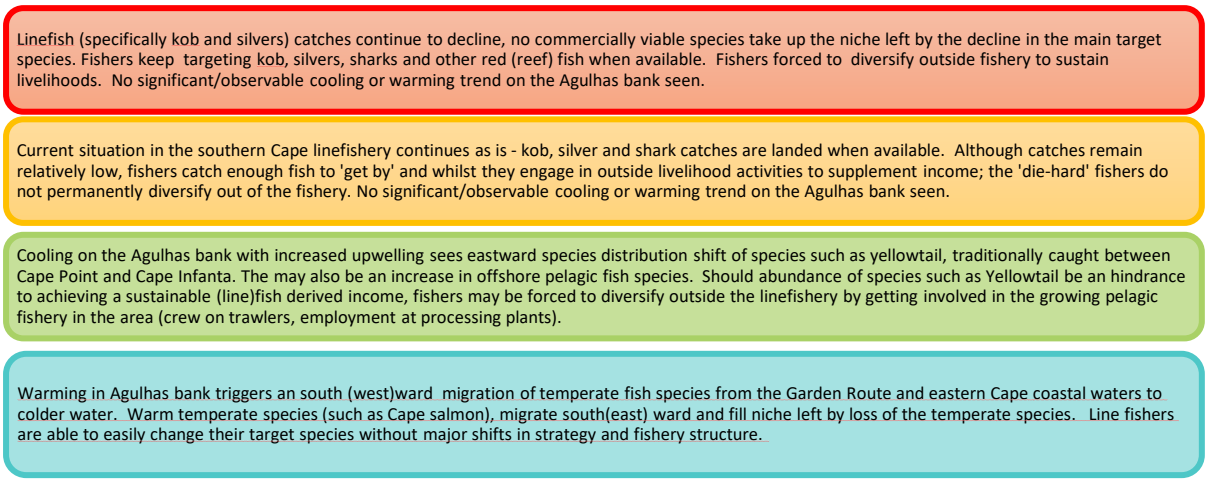

Figure A2.1. Four future scenarios for the linefishery based on current and possible future species distribution and abundance changes in the Agulhas Bank. Warming and cooling trends in the Agulhas bank have been incorporated

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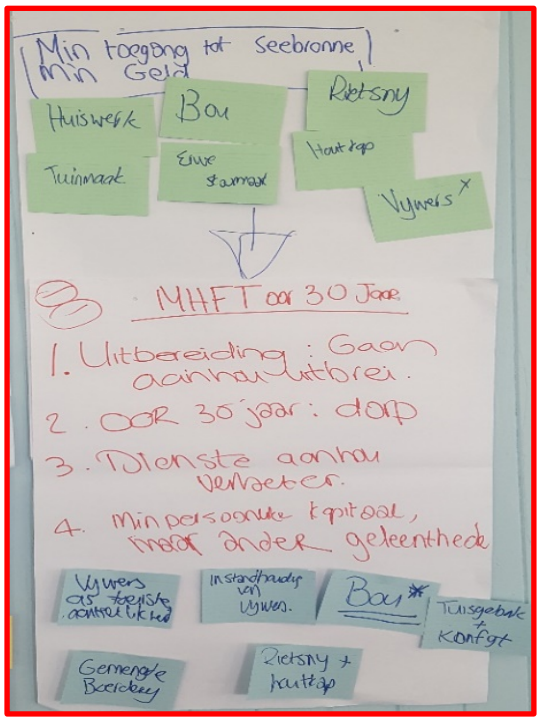
Appendix 2: Participant-derived scenario stories



Insufficient access to marine resources/ insufficient money

Current & potential activities:

Cleaning houses, Building, Cutting reeds Gardening, Yard clearing, Fish traps

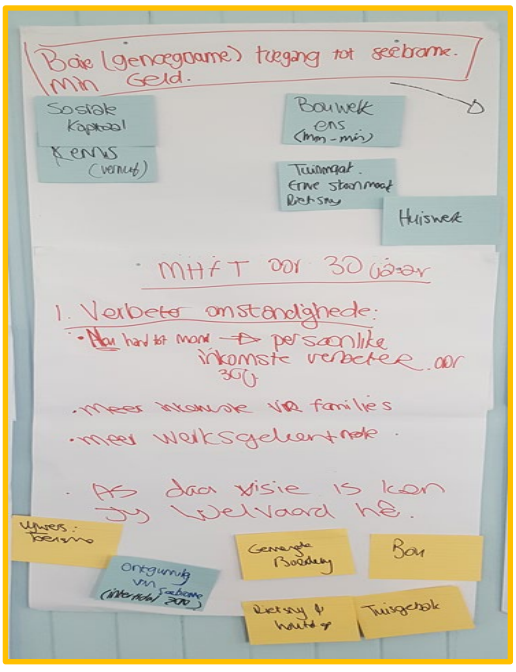
Melkhoutfontein in 30 years:

1. Town will keep on expanding.
2. In 30 years – proper town
3. Improving services
4. Little personal capital, but other opportunities

Possible future activities:

Fish traps as tourist destination, maintenance of fish traps. Building, home bake, mixed farming, reed & woodcutting

Figure A1.1. Elements of the "Insufficient access to marine resources/Low disposable income scenario" as identified in workshop 3: green cards depict current and potential activities that participants engage in at present. The red text reflects the town in 30 years; blue cards indicate future livelihood activities that could be engaged in. The left panel shows a photograph of the results of the original story exercise in Afrikaans, whilst the right panel provides a translation.



Insufficient access to marine resources/ insufficient money

Current & potential activities:

Use social capital (knowledge), building, home bake, clear yards/land, reed cutting, cleaning homes.

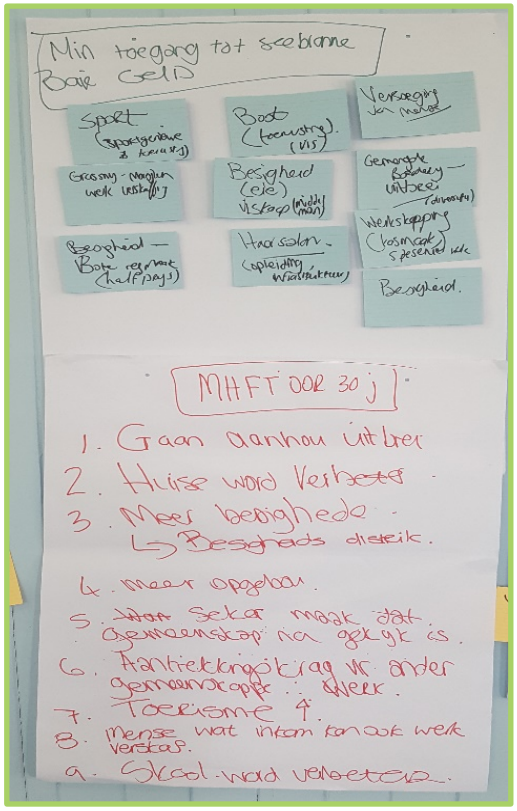
Melkhoutfontein in 30 years:

1. Improve conditions – present hand to mouth, improves over 30 years.
2. More income for families
3. More employment opportunities

Possible future activities:

Fish traps as tourist destination, harvesting of marine resources, mixed farming, reed & wood cutting and home bake.

Figure A1.2. Elements of the "Sufficient access to Marine resources/low disposable income scenario" as identified in workshop 3: blue cards depict current and potential activities that participants engage in the present time. The red text reflects the town in 30 years, and yellow cards indicate future livelihood activities that could be engaged in. The left panel shows a photograph of the results of the original story exercise in Afrikaans, whilst the right panel provides a translation.



Insufficient access to marine resources/ Sufficient money

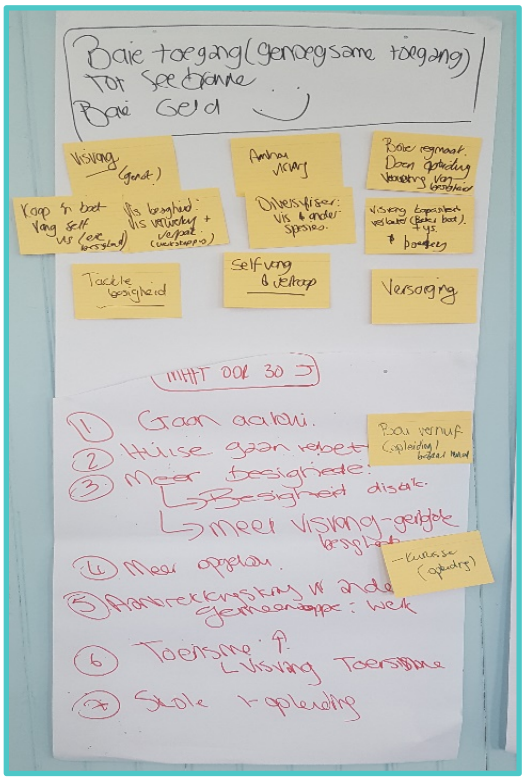
FUTURE activities:

Sport (amenities & equipment), boat (equipment), caregiving, grass cutting (machines; provision of employment), own business (buying fish; middle-man), mixed farming (diversify), business – fixing of boats, hair salon (training, infrastructure), job creation (cooking), own business.

Melkhoutfontein in 30 years:

1. Town will keep on expanding.
2. Houses will be improved.
3. More businesses – business district
4. More urbanised town
5. Ensure community is looked after.
6. Attraction for other communities ito work
7. More tourism
8. People that move to town can also provide work.
9. Improved school

Figure A1.3. Elements of the "Insufficient access to Marine resources/Sufficient disposable income" scenario identified in workshop 3: blue cards depict future livelihood activities that participants could engage in. The red text reflects the town in 30 years. The left panel shows a photograph of the results of the original story exercise in Afrikaans, whilst the right panel provides a translation.



Sufficient access to marine resources/ insufficient money

Potential activities (businesses):

Fishing (for recreation), commercial fishing (skipper with own boat), fixing boats & training, fish processing & distribution, diversify fishing activities, improve fishing capacity, tackle shop, care duties, building (training), other courses.

Melkhoutfontein in 30 years:

1. Town will keep on expanding.
2. Houses will be improved.
3. More businesses – business district
4. More fishing-related businesses
5. More urbanised town
6. Attraction for other communities ito work
7. More tourism (including fishing tourism)
8. Improved schooling and training (opportunities)

Figure A1.4. Elements of the "Sufficient access to Marine resources/Sufficient disposable income scenario" identified in workshop 3: yellow cards depict future livelihood activities that participants could engage in. The red text reflects the town in 30 years. The left panel shows a photograph of the results of the original story exercise in Afrikaans, whilst the right panel provides a translation.

Scenario Stories from the participants

"Nothing much has changed" - Insufficient access to marine resources /low disposable income

Participants agreed that this scenario space, where there is little access to marine resources and low disposable income levels, most closely resembled the present situation. As a starting point, general discussions focused on the difficulties that exist in an income-constrained environment. Notably, participants raised and reiterated the point that to make money, one must have money. Next, livelihood activities that could be undertaken in a resource-constrained environment were discussed. Most of the activities highlighted were activities that participants are currently engaged with. To promote the forward-thinking approach required for scenario construction, participants were particularly asked to consider what other activities they could presently consider engaging in.

The second part of the discussion required participants to reflect on descriptions of what Melkhoutfontein would "look like" in 30 years in this scenario space. When considering future Melkhoutfontein, participants foresaw that a current national government housing project would be ongoing. By implication, the town's infrastructure regarding housing would be improved from the current situation. As a result, Melkhoutfontein would be a fully-fledged town with improved amenities and services. However, inadequate disposable income means that people remain stuck in similar cycles engaging in similar tasks as in the present. The sentiment was that people would survive, but life would not have changed much. Participants did, however, indicate that alternative livelihood opportunities would manifest over time and that wealth could be built across generations (on longer time scales).

"We will get there – eventually" – Sufficient access to Marine resources/low disposable income

This scenario discussion took place along the same lines as that for the first scenario space. This could be because, for some participants, this scenario closely resembled the present situation. In addition, livelihood activities in this scenario space closely resembled those in the first scenario. Ultimately, the sentiments expressed echoed those by participants at the start of the workshop when they indicated that one needs money to make money by reiterating that insufficient disposable income and the inability to access a large amount of capital was the most significant barrier that exists for them. To earn a sustainable fishery derived income, fishers need to have enough capital for day-to-day running expenses and need to access capital to buy equipment and training. As with the Bayesian network development process, participants highlighted the need for money to access skills training (such as skipper training).

Participants foresaw that the development trajectory for Melkhoutfontein would continue along the same lines in the first scenario space. Infrastructure development, managed by the central government, would continue independently from community socio-economic circumstances. Importantly, fishers emphasized again that they would accumulate personal wealth, albeit over a much more extended period. One of the participants pertinently noted that "if you have a vision, you can have wealth".

"The going is good" - Insufficient access to marine resources /high disposable income

Discussions around this scenario space were much more optimistic, and after some initial hesitation, discussions were quite animated. To prompt the conversation and ensure even participation, each participant was asked to identify some livelihood activities they would choose to engage in if money was not a problem (bearing in mind that fishing activities were not an option). The activities identified were wide-ranging. Notably, all participants indicated they would own their own business while creating employment opportunities. Overall, community upliftment was a common theme among participants. While all the participants identified service-oriented businesses far removed from any maritime-related activity, a small number of participants also indicated they would capitalize on current skillsets by engaging in the fishing-related services industry, such as selling tackle and repairing boats. In addition, governmental housing projects would be ongoing. More disposable income means more opportunities

for the town's inhabitants and, with it, a general and accelerated improvement in socio-economic conditions for fishers and the wider community.

"The future is bright" - Sufficient access to marine resources /High disposable income

The discussion for this scenario space was the shortest compared to the other scenario spaces (Figure 5.9). This was because there was a fair amount of repetition from the previous scenario spaces, and participants became fatigued. When considering livelihood activities in this scenario space, all but one of the participants indicated that they would revert to fishing as a principal livelihood activity. The ensuing discussion highlighted that sustaining a livelihood by harvesting marine resources was dependent on biophysical subsystem conditions. Nevertheless, many participants indicated that they would still choose to engage in the livelihood activities identified previously to guarantee livelihoods. This would be achieved by assuming an oversight role in the business that allowed them to go fishing without detriment to the business when they could do so. Thus, the development trajectory for Melkhoutfontein mainly remained unchanged from the previous scenario space.

Appendix 3. The final scenario stories

The starting point

It is 2018, and South Africa's new Small-Scale Fisheries Policy is slowly and systematically implemented throughout coastal communities. However, fishers are optimistic about the possibilities that the successful implementation of the policy will mean for them and their communities. The opportunity to participate in a community co-operative and directly benefit from the sale of fish and other livelihood activities poses an opportunity to promote and cultivate more sustainable livelihoods. This enables fishers to grow personal wealth and also for the overall improvement of Melkhoutfontein.

The present-day situation finds fishers with limited access to marine resources and little to no disposable income. Most small-scale fishers act as crew on linefishery boats. The demand for 'a site' on a boat is high as the demand for crew has steadily become less as skippers/commercial rights holders leave the fishery. Implementing the small-scale fisheries policy has also created some conflict amongst skippers and crew. Some small-scale fishers lose their 'site' on boats just because their names appear on the provisional list of verified small-scale fishers. Small-scale fishers in the community do not currently hold Interim Relief rights with access to fish in the river also blocked by regulation. Although fishers are optimistic about the policy and its implementation, there is also much uncertainty about the future. Most of this uncertainty is around the basket of species allocated as part of the community right or co-operative. Implementation timelines are also uncertain, and many deadlines and implementation targets have already been delayed. Conditions in the biophysical environment are also highly variable and not optimal. Fishers are only able to fish a couple of days a month as sea days have become scarce. Sea surface temperature, wind direction and strength, and current direction and strength are not within the optimal ranges.

The present economic conditions mean that employment is scarce, and living is expensive. Fishing is lucrative when the fish bite, but catches are not plentiful even when fishers manage to fish. It is not entirely clear why the kob has become so scarce, although the activities of the Inshore Trawl sector are thought by many to play a vital role. In the meantime, fishers engage in a variety of alternative livelihood activities. They do not make much money, and although they struggle to make ends meet, they do manage to get by. Current livelihood activities are wide-ranging, with fishers drawing on their current, often limited, skillsets. Activities include the gathering and selling of firewood, gardening, reed harvesting, housework and building labor.

Scenario 1 - "Nothing much has changed"

This is a story about limited opportunities in a resource-constrained environment where a broad set of circumstances severely limits economic growth on micro - and macro-scales. The chaotic implementation of the Small-Scale Fisheries Policy has led to a situation where, 30 years later, small-scale fishers are left with little to no access to marine resources. Not much has changed since 2017, and it is unclear when these persisting issues will end or be addressed meaningfully. The government has been forced to repeatedly extend the interim relief policy of the 2000s to provide some access to marine resources. However, obtaining Interim Relief permits is complex. Many fishers active in 2017 have passed on or retired, with the few new entrants to the fishery borne out of necessity in the absence of other employment opportunities. The few remaining fishers from Melkhoutfontein still try to engage in interim livelihood activities where possible, although many do not have permits. They also continue to crew on

linefish boats. However, more fishers require work as crew than there are available 'sites', and most fishers do 'odd' jobs where they can.

Linefish (specifically kob and silvers) catches have continued to decline slowly over the past 30 years. No new commercially viable species have moved into the niche created by the decline of the primary target species. As a result, fishers continue to target kob/silvers when they can, supplementing income with informal activities and employment outside the fishery to sustain basic livelihoods. The weather and climate are highly variable, with the Western Cape becoming increasingly drier over the past 30 years. Although the southern Cape is not impacted as severely as the rest of the province, an increase in population and a highly variable local climate place an additional burden on agriculture and other water-intensive activities. The cost of mitigating the long-term impacts of these climate-driven impacts adds strain to the already struggling provincial and national fiscus, adding pressure to the already struggling economy.

The South African economy has continued to grow slowly, and disposable income is constrained due to low growth and limited local employment opportunities. Nevertheless, Melkhoutfontein has continued to expand due to the government works program (fulfilling housing demand by building RDP housing[1]). Due to the high demand for houses and as the area's population has increased, this long-term project ensured that Melkhoutfontein had grown steadily over the last 30 years to become a fully-fledged town with the necessary infrastructure and services associated with an established rural town. However, investments from residents and private companies remain low, thereby constraining development. In addition, the town struggles with the social ills associated with low socio-economic development levels, such as substance abuse. Therefore, it remains challenging to escape the poverty trap in which most people find themselves.

Scenario 2 - "We will get there –eventually."

This is a story about cautious optimism. Although fisher attrition rates have been high, implementing the small-scale fisheries policy in 2019 has resulted in the establishment of primary and secondary co-operatives, with new entrants steadily entering the co-operatives as needed. However, prevailing economic conditions at the time of policy implementation mean that fishers never received the initial capital injection needed to get the co-operatives up and running correctly; as a lack of access to fishing gear and funds to acquire and maintain gear being the biggest obstacle to successfully exploiting the community right. Fishers are thus forced to, in addition to limited, small-scale activities, continue crewing on commercial linefish boats. However, employment opportunities on these boats remain limited as there is more available crew than required. The current situation in the southern Cape Linefishery continues as has been for the last 30 years - kob and silver catches are sporadic and are landed when available. Although catches remain relatively low, fishers catch enough fish to 'get by' and while they engage in outside livelihood activities to supplement income; the 'die-hard' fishers do not leave the fishery. However, small-scale fishers can harvest enough resources to feed the family (at the very least), which frees up some income for other activities.

[1] RDP housing is a commonly used term for social housing, provided by the South Africa government to poor households.

The southern Cape weather and climate remain highly variable, with the Western Cape becoming increasing drier over time. However, the southern Cape is not impacted as severely as the rest of the province, although an increase in population and a highly variable local climate place an additional burden on agriculture and other water-intensive activities. In addition, the cost of mitigating the long-term impacts of these climate-driven impacts adds strain to the already struggling provincial and national fiscus, adding pressure to the already struggling economy. As a result, the South African economy has continued to grow slowly, and disposable income is constrained due to low growth and local employment opportunities.

Melkhoutfontein has continued to expand due to the government works program (fulfilling housing demand by building RDP housing). Due to the high demand for houses and as the area's population has increased, this long-term project ensured that Melkhoutfontein has steadily grown to become a fully-fledged town with the necessary infrastructure and services associated with an established rural town. However, investments from residents and private companies remain low, thereby constraining development. Unemployment remains high, and the town struggles with the social ills associated with low socio-economic development levels, such as substance abuse. It remains challenging to escape the poverty trap in which most people find themselves. Fishers' wealth has grown VERY slowly, and while this growth has not led to a sizeable disposable amount of capital, fishers have been able to make small improvements to their living condition.

Scenario 3 - "The going is good."

This is a story about growth and prosperity. Although the small-scale fisheries policy was successfully implemented in 2019, fishers cannot successfully exploit their rights at the scale required to sustain and improve their livelihoods. Cooling on the Agulhas bank has increased upwelling resulting in traditional upwelling associated species such as Yellowtail becoming increasingly abundant. Although other linefish species are available to target in the absence of kob and silver, catches are not big enough to sustain a fishery-derived income. As a result, fishers who wish to continue engaging in fishery activities are forced to seek employment in the growing industrialized fishing sector in the area – either as crew on trawlers or in the fish processing plants.

However, the increase in the availability of commercially exploitable fish was gradual, and fishers could get both their primary and secondary co-operatives up and running. These co-operatives were managed sustainably with the secondary co-operative, focusing on the direct marketing of fish and engaging in alternative livelihood activities in times of fish scarcity. Fishers have thus, over the last 30 years, managed to accumulate capital. Coupled with this, a shift in macroeconomic policy after the 2019 elections has resulted in South Africa experiencing better growth, positively impacting the unemployment rate. The southern Cape weather and climate remain highly variable, with the western Cape becoming increasing drier over time. Pro-active planning from all levels of government means that although there are additional associated costs of mitigating long-term climate-driven impacts, the burgeoning economy means that the government can carry many of the mitigation costs. Better access to capital and funding has resulted in fishers being able to diversify outside the fishery. Most have moved away from engaging in grassroots livelihood activities to set up small business enterprises mainly concerned with service provision. Examples of such business include fixing boats, buying and selling fish (as middlemen), setting up a hair salon, selling tackle and other boating equipment, expanding a current mixed agriculture farm, care provision. Most of these businesses employ at least two/three local community members.

The government has continued providing primary housing through the public works project initiated in the 2010s, with all housing requirements being met. As more capital/funding is available in the town, many community members have enough disposable income to improve their homes. As there are more businesses in the town, a formal business district has developed, and the town has increasingly urbanized as infrastructure expanded. Public facilities such as schools have been improved (specifically as higher school fees can be collected). The improvements to the town have led to the migration of people from other towns seeking new opportunities, and tourism to the area has also increased. In general, Melkhoutfontein has seen a steady improvement in socio-economic conditions, resulting in better food security and the well-being of fishers and the town.

Scenario 4 – "The future is bright."

This is a story about growth, prosperity and personal satisfaction. Warming in the Agulhas bank has triggered south (west) ward migration of warm temperate fish species. As a result, line fishers easily changed their target species without significant shifts in strategy and fishery structure. However, the government was proactive in creating an enabling environment to encourage the continued participation of these fishers. Supported by the successful implementation of the small-scale fisheries policy, fishers have been able to sustain and advance livelihoods with their fishery derived as their only and most significant sources of income. Thus, over the last 30 years, Fishers have managed to accumulate enough wealth to engage with various economic activities proactively. Coupled with this, a significant shift in macroeconomic policy after the 2019 elections has resulted in South Africa experiencing significant long-term economic growth resulting in record-low unemployment rates.

The southern Cape weather and climate remain highly variable, with the Western Cape province becoming increasingly drier. However, the southern Cape is not impacted as severely as the rest of the province, although an increase in population and a highly variable local climate place an additional burden on agriculture and other water-intensive activities. With the booming economy, proactive planning means that the government easily bears mitigation and risk aversion costs with projects creating an opportunity for innovation and employment.

Better access to capital and funding has resulted in fishers diversifying inside and outside the fishery. As a result, most have moved away from engaging in grassroots livelihood activities to set up small business enterprises. However, many generational fishers have chosen to remain engaged with fishing-related activities or businesses by planning their livelihood activities around deriving a fishing-related income. For those who opted to keep on fishing, the presence of disposable capital means that they can afford skipper training, boats and related equipment. Thus, they both catch and market their fish while employing crew from the community.

The government has continued providing primary housing through the public works project initiated in the 2010s, with all housing requirements being met. As more capital/funding is available in the town, many community members have enough disposable income to improve the houses allocated to them. As there are more businesses in the town, a formal business district has developed, and the town has increasingly urbanized as infrastructure expanded. Public facilities such as schools have been improved (specifically as more school fees can be collected). The improvements to the towns have led to the

migration of people from other towns seeking new opportunities, tourism to the area has also increased. In general, Melkhoutfontein has seen a steady improvement in socio-economic conditions, resulting in better food security and the well-being of fishers and the town in general.

Appendix 4: Providing feedback to participants

The resources (pamphlet and booklet) – produced in Afrikaans and English - as part of the feedback is shown in Figure A4.1 and 4.2

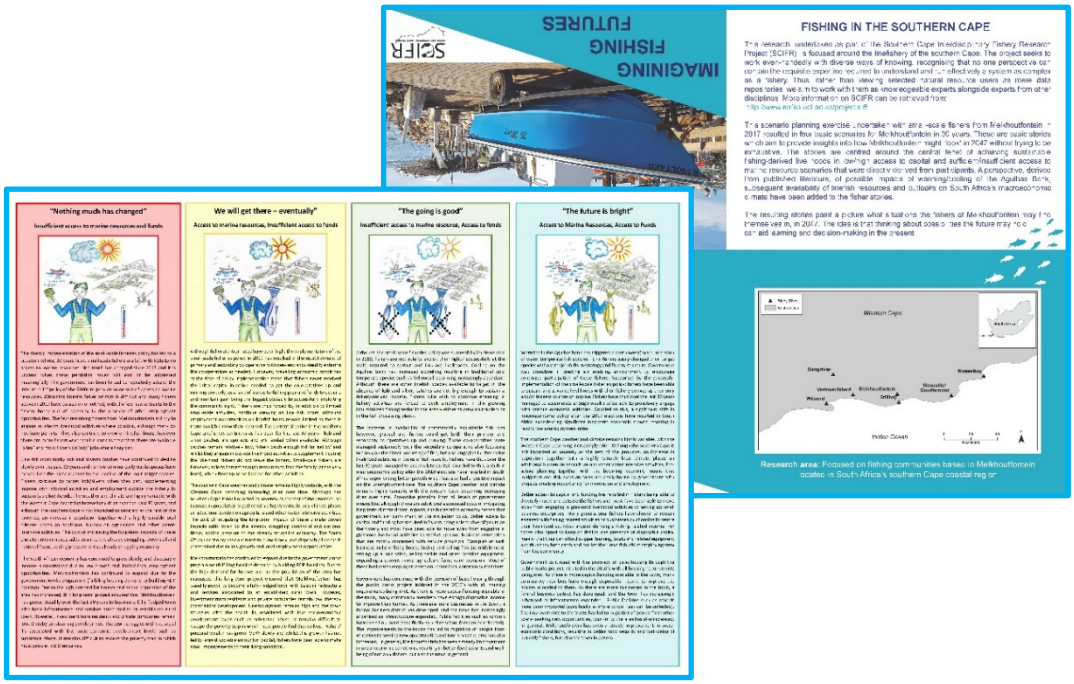


Figure A4.1. The pamphlet was produced for feedback to the fishers (presented folded twice over, i.e. A6 format). The pamphlet was made available both in English and Afrikaans (from Gammage, 2019).

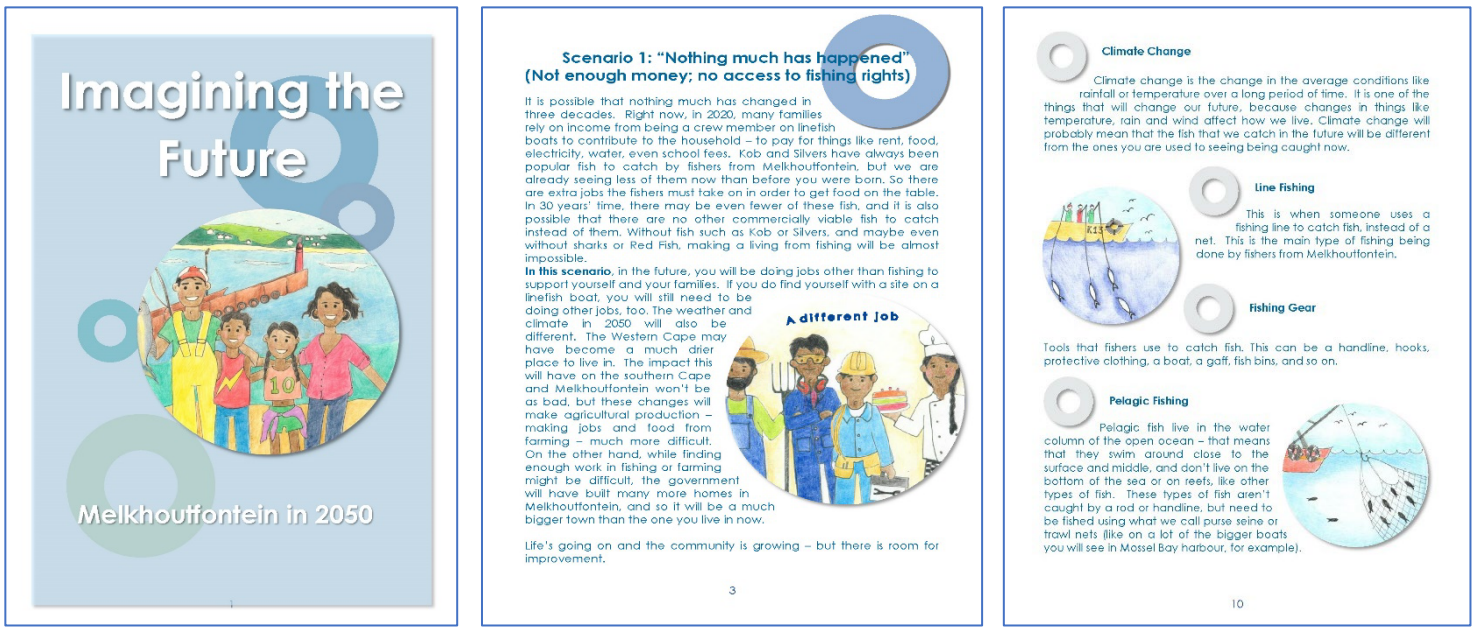


Figure A4.2. The cover and selected pages from the children's (A5) booklet. The illustrated booklet was made available both in English and Afrikaans. It included some general background information on scenario planning, the revised stories and a glossary of terms

LITERATURE CITED

Gammage LC. (2019) Verbeelde visvangs toekomste / Imagining fishing futures. Brochure (in Afrikaans and English), SCIFR project, SA Research Chair in Marine Ecology & Fisheries, University of Cape Town)