OCEAN GOVERNANCE IN SOUTH AFRICA:
POLICY AND IMPLEMENTATION

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A thesis submitted in partial fulfilment of the requirements for the degree of Doctor Philosophiae in the Institute for Poverty, Land and Agrarian Studies; Faculty of Economic and Management Studies; University of the Western Cape.

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KEYWORDS

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Phronetic Social Research
Optimal Grounded Theory
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Ecosystem Based Management
Oceans Economy
Marine Spatial Planning
Marine Social Benefits

ABSTRACT

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Ocean Governance in South Africa has gained momentum over the last decade with the publication of the Green and White Papers on the National Environmental Management of the Ocean in 2012 and 2014, and the promulgation of the Marine Spatial Planning Act in 2019. Parallel to this South Africa developed and implemented the Operation Phakisa Ocean Economy Development Programme and declared a network of twenty Marine Protected Areas. The timing of this study over the last five years allowed the opportunity to undertake a detailed study of the Ocean Governance Policy Development and Implementation as the formulation of the policy and its early implementation unfolded. The Study is primarily based on interpretation of the Green and White Papers as the primary and directed ocean governance policies produced by the Government of South African and the National Department of Environmental Affairs. It places these most recent specific ocean environmental policies in the context of the many other environmental policies that exits in the country.

The study followed a general Optimal Grounded Theory Approach within a Phronetic Social Research Model to reveal a conceptualization of the Ocean Governance context in South Africa. This conceptualization process made possible the formulation of recommendations on the Ocean Governance Policy Implementation.

The process, findings and recommendations of the study are focused on assessing the National Ocean Policy in relation to national objectives and international trends; developing a balanced and supporting science, information and knowledge base; implementing a regional ecosystem-based approach to ocean management; and considerations for undertaking Marine Spatial Planning in South Africa.

The study concludes that South Africa is following global trends in ocean governance but can be more articulate of its National interests and benefits. South Africa has a strong biodiversity focus in its Ocean Governance Policy, and this must be acknowledged in the development of the ocean economy. People centred policy implementation will be critical during intergovernmental cooperation and the inclusion of stakeholders in Marine Spatial Planning processes. There is opportunity for South Africa to influence regional and global ocean management through application of the eco-system based approach across regional, international and large marine ecosystem programmes. A more balanced information and knowledge base is required, through coordinated and transdisciplinary science programmes, to offer better understanding and management support of complex socio-economic-ecological dynamics. South Africa will also need focused interventions in ocean technology and engineering programmes to develop its national marine economy. Ocean Governance and Marine Spatial Planning implementation mechanisms must find ways to collect and share information equitably and uniformly. Roles and responsibilities, as well decision criteria must be clearly defined, communicated and applied consistently.

South Africa's implementation of its Ocean Governance Policy and the Marine Spatial Planning Act will take place during an economic crisis, where economic development and job creation will be demanded of all Government programmes.

May 2020

DECLARATION

I declare that *Ocean Governance in South Africa: Policy and Implementation* is my own work, that it has not been submitted for any degree or examination at any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Ashley Desmond Naidoo May 2020

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I thank my parents for their unwavering high expectation and my children for their patience. Ultimately, I must acknowledge and thank my wife Latasha, without whom this endeavour was not possible, for the space, late nights and early mornings.

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List of Abbreviations

AHP – Analytical Hierarchy Processes
BCC – Benguela Current Commission
CBD – United Nations Convention on Biological diversity
CGS – South African Council for Geoscience
CSIR – South African Council for Scientific and Industrial Development
CCAMLR – Convention for the Conservation of Antarctic Marine Living Resources
DAC – South African National Department of Arts & Culture
DAFF South African National Department of Agriculture, Forestry & Fisheries
DEA – South African National Department of Environmental Affairs
DEFF – South African National Department of Environment, Forestry & Fisheries
DHET– South African National Department of Higher Education & Training
DME – South African National Department of Minerals & Energy
DoT – South National Department of Transport
DoD – South African National Department of Defence
DRDLR – South African National Department of rural Development & Land Reform
DST – South African National Department of Science & Technology
EAF – Ecosystem Approach to Fisheries (Management)
EBM – Ecosystem Based Management
EBSA – Ecological & Biologically Significant Areas
EC – European Commission
EU – European Union
EEZ – Exclusive Economic Zone (UNCLOS Provision)
GT – Grounded Theory
CGT – Classical Grounded Theory
ConGT – Constructivist Grounded Theory
OGT – Optimal Grounded Theory
ICMA – Integrated Coastal Management Act
IORA – Indian Ocean Rim Association
IPBES – Intergovernmental Science-Policy Platform on Biodiversity & Ecosystem Services
IPCC – Intergovernmental Panel on Climate Change
MCDA – Multi-criterion Decision Analysis
MLRA – Marine Living Resources Act
MLRF – Marine Living Resources Fund
NBA – National Biodiversity Assessment
NRF – National research Foundation
MPA – Marine Protected Area
MSP – Marine Spatial Planning
MSPA – Marine Spatial Planning Act
NEMA – National Environmental Management Act
NEMBA – National Environmental Management Biodiversity Act
NEMO – White Paper on the National Environmental Management of the Oceans
NEMPAA – National Environmental Management Protected Areas Act
OCIMS – National Oceans and Coasts Information Management System

SAEON – South African Earth Observation Network
SAIAB – South African Institute for Aquatic Biodiversity
SANSA – South African National Space Agency
SAP – Strategic Action Plan
SAWS – South African Weather Services
SEMA – Specific Environmental Management Act
TDA – Transdiagnostic Analysis
UNFCCC – United Nations Framework Convention on Climate Change
UNCLOS – United Nations Convention on the Law of the Sea
UNCSD – United Nations Conventions on Sustainable Development
WIOMSA – Western Indian Ocean Marine Science Association

1. INTRODUCTION: The Ocean – Our Nearest Future

"The dark oceans were the womb of life: from the protecting oceans life emerged. We still bear in our bodies – in our blood, in the salty bitterness of our tears-the marks of this remote past. Retracing the past, man, the present dominator of the emerged earth, is now returning to the ocean depths. His penetration of the deep could mark the beginning of the end for man, and indeed for life as we know it on this earth: it could also be a unique opportunity to lay solid foundations for a peaceful and increasingly prosperous future for all peoples." (Arvin Pardo, Maltese Ambassador to the United Nations; United Nations General Assembly 22nd Session; First Committee 1515th Meeting, 1 November 1967.) This statement was part of a larger motivation calling for the responsible governance and management of the ocean. Many credit this statement among the initial calls that led to the development of the United Nations Law of the Sea.

The trends that the Ambassador observed and predicted have continued and increased over the last century. Increasingly nations across the world have begun looking to the oceans for economic and commercial exploitation of their natural capital and trade opportunities. Parallel to this, science has over several decades established the earth's ocean as a dominant driving force of the global natural system. There is much appreciation of the role of the ocean, both in the patterns of nourishing rainfall and also in the genesis of devastating storms, storm surges, tsunamis and even droughts. More recently the ocean is appreciated for its role in the earth system in the distribution of heat; salt; nutrients and cycling of other key earth system drivers such as carbon-di-oxide and oxygen.

The burgeoning global human population and the technological advances in ocean industrialization are working together to create the urgent need and opportunity for people to increasingly include the ocean when considering the total sustainability potential of the earth. The ocean covering a little more than 70% of the planet's surface is rightfully emerging as the arena of the next major human evolutionary endeavour. While space exploration holds many opportunities for humankind's future evolution, the proximity and growing accessibility of the ocean, certainly present the ocean as our nearest future.

This study aims to evaluate the critical criteria required for the successful implementation of South Africa's Policy on the National Ocean Environmental Management of the Ocean which was adopted by Cabinet in 2014. The successful implementation of this Policy could allow for the ocean's contribution towards South Africa's triple challenges of poverty, inequality and unemployment to be realised. The study aims to contextualize the major objectives of the Policy and assess the context, assumptions and critical factors for implementation. The study will achieve this through comparison with ocean management objectives of global agreements and other-country national ocean policies, reviewing literature on marine spatial planning and ocean governance initiatives and interviewing key informants on Ocean Governance Implementation.

The 1982 United Nations Law of the Sea (UNCLOS) was the most elaborate policy design on ocean governance to encourage efforts in ocean governance, use and even protection of the ocean. UNCLOS, through allowing coastal countries to claim sovereign use rights for 200 nautical miles into the ocean, provided countries with inherent, nationalist (or selfish) motivation to provide governance and security approaches to "their" ocean areas. Initially this provided coastal nations with an international legal framework through which to engage distant water fishing nations; and then the emerging distant marine oil and gas mining nations.

However, over the last half century, as the capacity of ocean industries increased; the multi-sector and dynamic nature of ocean users have evolved. The multi-use and overlapping locations and impacts of ocean sectors have led to an increasing number of coastal states developing oceans policies (Cicin-Sain et al., 2015).

Generally, these policies define processes to prioritize; arrange and order the ocean sectors. Industrial sector participants include both nationals of coastal states and multi-nationals across fishing, shipping and oil and gas. These traditional sectors expanded as technology and affordability became more accessible and new sectors emerged to include tourism; telecommunication cables; biodiscovery of useful genetic and chemical compounds and reactants for pharmaceutical applications; and renewable energy production such as thermal, salinity, tidal, wind and waves.

Parallel to this growth of the economic sectors, there is a building of the world agenda on the protection, conservation and management of the ocean, as a critical and arguably the dominant feature of the planet system. National ocean policies often seek to address this conservation agenda as well as the ordering and planning of the commercial sectors. The extent of expansion into the oceans is indicated by the total of 29 Contractor applications for exploration in the High Seas Area that have been lodged with the International Seabed Authority (see https://www.isa.org.jm/maps accessed on 8 February 2020, showing a list of individual contractor maps).

South Africa has recently followed a similar trend of looking to the ocean to build new industrial opportunities and grow its economic output. South Africa has, in the industrialized era, been a major economic player from the African continent owing to its mining sector and to a lesser extent its agriculture sector. With an abundance of mining resources and sufficient agricultural output there has not been a strong push to venture into the oceans so far. Thus resources from the ocean sectors have traditionally not made up large contributions to the South African gross domestic product (GDP), with contribution to GDP from ocean resources making up less than 4% in 2010 (Hosking et al., 2014).

In the post-1994 democratic period, especially over the last decade South Africa has had increasing unemployment rates. Statistics South Africa, as the primary statistics collecting government agency, calculates unemployment at 26.7% for Quarter 1 in 2016 (Statistics South Africa, 2016) and 29.1% in Quarter 4 of 2019 (Statistics South Africa, 2020). Growing the economy, creating new jobs and lifting a large segment of the population out of poverty is therefore a priority of the current government administration. These priorities are articulated in the President's opening of Parliament Address (Ramaphosa, 2020) and in the South African National Development Plan which was developed in 2010 and has planned outcomes for 2030 (National Planning Commission, 2012). Successive government administrations are expected to respond to the National Development Plan.

South Africa's development needs are often described as the triple challenge of poverty, inequality and unemployment (Mail & Guardian, 2012; International Labour Organisation, 2019).

1.1. South Africa's Emerging Interest in the Ocean

Ocean Governance was highlighted with the publication of the South African White Paper on the National Environmental Management of the Oceans in March 2014 (NEMO, 2014). Later in 2014 the South African Government hosted a strategic and operational planning session for the development of the Ocean Economy called Operation Phakisa: Unlocking the Economic Potential of South Africa's Oceans.

The National Development Plan (NPD) produced by the Presidency in 2012 requests that the maritime sector be "reappraised" for its potential contribution (National Planning Commission, 2012). The NDP is a guiding document on South Africa's plan to achieve government's economic development objectives and has the explicit objective of providing a better quality of life for all citizens. This National Plan has a planning horizon up to 2030. The NDP does not expand further on this brief phrase regarding oceans. The rapid development of the ocean economy is however, emphasised in the Governments Nine Point Plan, which was announced in 2015, during the President's State of the Nation Address (Zuma, 2015).

The Green Paper on the National Environmental Management of the Oceans which preceded the White Paper argued that as South Africa has both a relatively long coastline and a sizable Ocean Exclusive Economic Zone (EEZ), a governance policy is required: "South Africa's Constitution requires the protection, conservation and sustainable use of the environment. The ocean space under South

Africa’s jurisdiction is a wilderness area over twice the size of its land territory” (NEMO, 2012, p.1).

The South African Operation Phakisa: Unlocking the Economic Potential of the Oceans Programme highlighted that the large EEZ has economic growth potential. Operation Phakisa is a Presidential Initiative (Zuma, 2014) and seeks to deliver economic and social benefits from marine resources and industries urgently. It follows the “big fast results” methodology similar to that employed by the Malaysian Government (Van Wyk, 2015). The Oceans Phakisa process was undertaken in partnership with the Malaysian Government whose representatives guided the process. The Ocean Phakisa planning was the first undertaken with other Phakisa initiatives such as in Health and Tourism subsequently taking place.
It is currently appreciated that the ocean adjacent to South Africa is significant as both a source of natural heritage and economic growth. The Green Paper also highlighted that ecosystem, weather and climate functioning is significantly impacted by the ocean spaces adjacent to South Africa. This is due to the geographic location of the country that places South Africa under the influence of three ocean regions; the Atlantic Ocean on the West Coast, the Indian Ocean on the East Coast and the Southern Ocean lying between South Africa and Antarctica. The extent of South Africa’s coastline and the large oceans spaces that can be accessed does represent a considerable potential resource base. This geographic extent and jurisdiction are described in section 1.2 below.

The launch of the Phakisa Programme on Oceans Economy and the publication of the Green and White Papers on ocean environmental management highlights the growing interest and intention of the South African Government and the Department of Environmental Affairs in realising the ocean’s potential. The introduction to the Green and White Papers describes this interest from both a threats and opportunities perspective. In March 2016, the Department of Environmental Affairs published the first version of the Draft Bill on Marine Spatial Planning (Draft MSP Bill, 2016). The Bill focused on the marine spatial planning aspects of the Green and White Papers. Following on this, the Marine Spatial

Planning Framework was published for comment later in 2016 and reviewed following the comment process (Marine Spatial Planning Framework, 2017). This was published as a separate document from the Bill and aimed to illustrate the process of developing Marine Area Plans. The Marine Spatial Planning Act was gazetted following the Parliamentary processes and Presidential Signature in May 2019 (MSPA, 2019).

The Green and White Papers must be seen in the context of the existing National Legislation on Environmental Management. The post-1994 policy landscape is described in section 1.3.1 below. The increased profile of marine or ocean and coasts governance is also demonstrated through describing the development of government institutional arrangements mandated with this role in Section 1.3.2 below.

1.2. The South African Ocean and Coastal Jurisdiction

South Africa has a long coastline of about 3000 kilometres from the northern bank of the Orange River at the Namibian border to the Mozambique border. It has also established its ocean exclusive economic zone (EEZ) through the United Nations Convention on the Law of the Sea (UNCLOS, 1982). South Africa ratified the UNCLOS in 1997 (NEMO, 2012). The Exclusive Economic Zone is the area from the territorial waters or 12 nautical miles to 200 nautical miles offshore. In the EEZ, all the living and non-living resources on the ocean surface; in the water column, on and under the ocean floor are reserved for the sovereign use of the coastal state. A significant EEZ is also established around two small islands in the Southern Ocean; the Prince Edward and Marion Islands. These islands were annexed by South Africa in 1949 and while their terrestrial extent is relatively small; South Africa does claim the full EEZ that is allowed. The South African EEZ (1 540 000 km^2) is at present larger by 320 000 km^2 than its land territory (1 220 000 km^2). This resource base will almost double in size if the application for the extended continental shelf through the United Nations process is successful (Fig. 1.). The United Nations Law of the Sea made provision for coastal states to apply to extend their EEZ beyond the 200 nautical miles by proving that the continental slope of the coastal state continues to extend and therefore allows for additional claim area. The claim period for applications ended in 2009, and South Africa like many other countries is waiting for the evaluation of its claims. Countries have also been allowed to provide additional information after the deadline to substantiate their claims.

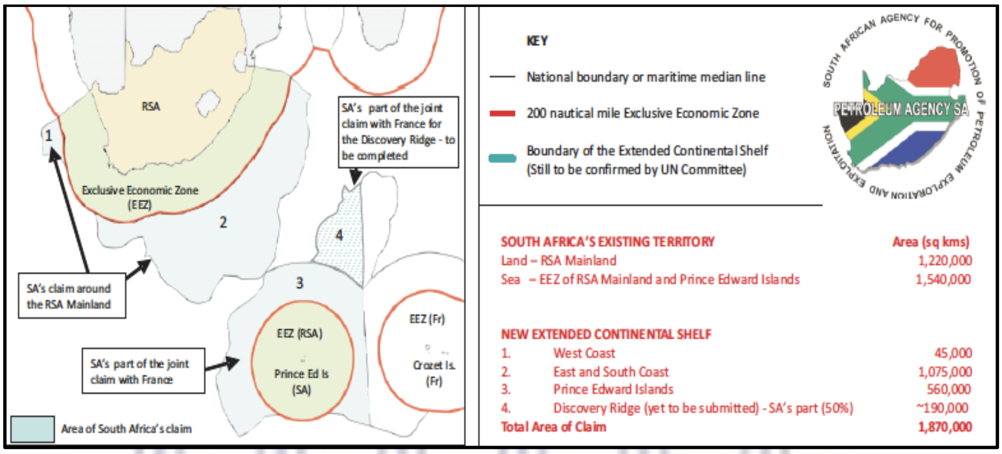

Figure 1. South Africa's Exclusive Economic Zone and the area applied for Under the Extended Continental Shelf Claim Provisions of UNCLOS produced by the Petroleum Agency of South Africa. (https://www.petroleumagencysa.com/images/pdfs/High_Flyer_advertorial.pdf)

1.3. The Evolution of the South African Ocean & Coastal Management

Since the 1994 emancipation; the South African Legislature has processed several new and re-drafted policies and Acts. This is also true for the environmental sector. The newly adopted, post 1994 Constitution included the specific Section 24 that contains what many regard as the citizen environmental rights (Republic of South Africa, 1996). Section 24 of the Constitution contains the following:

"Everyone has the right:

(a) to an environment that is not harmful to their health or well-being; and
(b) to have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that:
  i. prevent pollution and ecological degradation;
  ii. promote conservation; and

iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

These "environmental" citizen rights, which are elevated to the level of all other citizen rights embodied in the Constitution, guides the Government to conserve, protect and maintain the ecological integrity of the environment so that it does not present a risk to people. It also urges that the environmental assets are used sustainably in a manner that supports economic and social growth. Importantly this section of the Constitution includes the concept that environmental protection must be realized in a manner that extends across generations i.e. present and future generations. There is an inherent juxtaposition in these "environmental rights" which is contained in the limiting definition of sustainable development, when it is used together with protection, conservation and across generations. When combining all of these aspects, the Constitution asks for a balance between the distribution of benefits to the current generation and the subsequent generations – however, all aspects of the environment cannot be protected completely and consumed partly at the same time. While this is readily appreciated in consumptive resource exploitation, it is also true, albeit less apparent in non-consumptive resource exploitation. Alternative energy to fossil fuels, like wind and solar, still require infrastructure and equipment which, in their manufacture and operation, incur costs to the environment. The same is true for coastal aquaculture, which has costs external to the business costs of running the aquaculture plant such as environmental cost of natural water use and effluent discharge. This discussion is further elaborated on in Chapter Six.

1.3.1. The National Legislative Context

In 1998 two Acts relating to the management of the environment were adopted by the Cabinet of the South African Government. These were the Marine Living Resources Act (MLRA, 1998) and the National Environmental Management Act (NEMA, 1998). The MLRA and the NEMA are Acts of the highest rank being placed only below the Constitution. The MLRA has a very specific focus of management of marine living resources; primarily the allocation of commercial fish stocks. This Act notably did not include small-scale fishing but focused on the medium and large-scale fishing industry. The small-scale fishing sector was catered for much later in 2015 with the launch of the Small-Scale Fisheries Policy (Small Scale Fisheries Policy, 2012). The NEMA was a much broader Act and aimed to provide principles for decision making on environmental management. NEMA also set out to create institutions and cooperative arrangements across national, provincial and municipal tiers of government for the coordinated implementation of environmental laws.

These initial Acts were not created in a vacuum but replaced several older pieces of legislation that existed prior to 1994. After 1998, these Acts were supported with additional legislation including the National Environmental Management: Protected Areas Act (NEMPAA, 2004); the National Environmental Management: Biodiversity Act (NEMBA, 2004) and the National Environmental Management: Integrated Coastal Management Act (ICMA, 2009). These subsequent statutes were written as Specific Environmental Management Acts (SEMAs) under the NEMA. The NEMO Green Paper has a full list of National legislation that have a relevance to Ocean and Coastal Management and this is complemented by a review paper that focuses on coastal management specifically in South Africa (Goble et al., 2014).

1.3.2. The National Institutional Organization

The Branch Oceans and Coasts within the Department of Environmental Affairs came into existence on the 1st of March 2010. This is significant because it was the first time that marine environmental management and governance, excluded the fisheries function, and was raised to the level of a Branch in a National Department. The Branch level of organization is the highest unit of division within a Department and is headed by a Deputy Director General who reports to the Chief Executive of the Department; the Director General. This date, 1st March 2010, is also significant because the Department of Environmental Affairs was also created, for the first time, as a stand-alone Department with a Minister and Deputy Minister. Previously National Government organization saw this function housed within the Ministry of Water and Environment and previous to that within the Ministry of Environmental Affairs and Tourism.

Prior to 2010 the environmental management of the oceans was combined with the national fisheries management function. Fisheries science and management dominated in terms of appropriation of human resources and finances of the then Branch Marine and Coastal Management; as it was called in the Department of Environmental Affairs and Tourism. This biased allocation of resources within the Branch was evident in the staff percentage allocated to fisheries stock assessment science, management, compliance and enforcement compared to those allocated to the environmental research, conservation and management. The dominance of fisheries management was particularly evident within the research function where more than 80% of the budget allocated to research activities was directed to fish surveys and assessment (Marine Living Resources Fund, 2008). Research activities at the time included physical oceanography, plankton and marine top predators studies. The focus on fisheries is understandable in that this Branch's primary function was fisheries assessment and management, with the fishing industry paying contributions to the Marine Living Resources Fund. The association between fisheries and marine environmental management existed prior to 2010. This association is recorded since the earliest configurations of these functions within South Africa government arrangements, even prior to the 1994 post-apartheid era of government. Close linkages between marine and fisheries science and management is documented since the early 1900s (Payne & Lutjeharms, 1997). In 2010 the fisheries survey, management, compliance and enforcement functions were transferred to the newly created Department of Agriculture, Fisheries and Forestry. In 2019, through another macro-organization of National Departments, the Fisheries functions were transferred back to the Department of Environmental Affairs. This process is currently unfolding, with the implementation date set for the 1st of April 2020, the start of the financial year in South Africa.

1.4. Aims of the Research and Rationale for the Study

The study reviewed and assessed the development of the NEMO Policy and evaluated South Africa's present ability to implement this ocean governance framework. The addition and innovation that the NEMO policy adds to the South African environmental policy landscape was assessed. The architecture of the NEMO policy is defined around four strategic objectives, with the first two being a) information and b) knowledge. The third and fourth being c) environmental management and d) environmental integrity. The structure of the thesis is designed to address each of these strategic objectives.

This study is timeous, as South African had, in 2014, developed a strategic implementation plan to build the national ocean economy under the Presidential Phakisa Programme. The building of the ocean economy will impact the functioning of the marine ecosystems to various degrees. A key question is: Will the implementation of NEMO policy lay the foundation and trigger the necessary processes so that the expansion of the national ocean economy meets both the objectives of maintaining ecosystem integrity and responsible sustainable development as described in the South African Constitution?

The study proposes that the NEMO policy does add to the environmental policy landscape in South Africa and is significant in how it proposes Marine Spatial Planning (MSP) as a tool for ocean governance. The study further proposes that there will be serious challenges to implementing MSP as it theoretically defines a coordinated, integrated approach to planning conservation and industrialization of the ocean. Such ocean management coordination across and along sector departments and tiers of government in South Africa is new and will require a concerted effort in stakeholder engagements and alignment, within and outside the government sectors.

The primary research objective of this study was to assess the state of South African ocean governance context and evaluate national readiness to implement the Ocean Policy White Paper. The research offered key discussion points that must be dealt with in the implementation of the White Paper such as: How does the NEMO policy provide added value to the existing policy context for ecosystem management? Does the national marine research and monitoring capacity provide an adequate knowledge base for the implementation of the NEMO Policy? Can regional programmes be used to better achieve the ecosystem-based approach to marine management? What are the likely multiple objectives that will need to be negotiated in implementing marine spatial planning? To what extent do these compete or complement each other? What are the likely decision criteria to be considered when balancing these multiple objectives? The research provided a valuation and described a framework for appreciating the full set of ecosystem goods and services derived by South African society from its ocean and coastal ecosystems. This is important as MSP must seek a balanced prioritization across all ocean ecosystem goods and service benefits.

The study assessed the extent to which the NEMO policy objectives align with international trends; interpret the local information and knowledge capacities and identify further requirements for its implementation, and discusses critical operational elements required for its successful implementation. It did this in the context of the constitutionally defined objectives of sustainability and societal benefit. In achieving the objectives of this study, key concepts contained within the NEMO policy such as Ecosystem-Based Management; Ecosystem Services and Marine Spatial Planning are interpreted.

The timing of the study from 2015 to 2019 presented an opportunity for an in-depth case study of the evolution of the South Africa ocean governance policy, as during this period the ocean policy development moved from Green Paper in 2012, to White Paper in 2014 and Act in 2019, with the parallel development of the ocean economy through the Ocean Phakisa Programme.

1.5. Areas Outside the Scope of the Study

In assessing the state of the knowledge base that the NEMO policy needs to rely on, the study only assessed publicly funded science and monitoring at organs of state, including national departments, science councils, universities and research agencies. The study also only reviewed marine spatial planning as envisaged by the NEMO policy and did not include spatial planning described by the Integrated Coastal Management Act (ICMA, 2009) above the high-water mark and further did not include estuarine management plans or terrestrial spatial planning as contemplated in the Spatial Planning Land Use Management Act (DRDLR, 2013).

1.6. The Research Design and Method

A Grounded Theory-like approach was the underlying method used in this study and resulting analyses and thesis (Glaser & Strauss, 1967; Birks & Mills, 2015). This was used in combination with aspects of Qualitative Content Analysis (Cho & Lee, 2014). A detailed description of the Methods, Research Design and Conceptual Framework is provided in Chapter Two.

This decision to use Grounded Theory as an approach was based on that it is recommended as a method of discovery of a theory or pattern that is grounded in reality, through a variety of data forms. The data forms include all aspects of experiences of the real world from interviews, policy documents; speeches to observations. For the older student with working experience in the study field; such as this candidate, with two decades of experience; the notion that experience is validated as data is very attractive.

The original concept of Grounded Theory (Glaser & Strauss, 1967) evolved over the last six decades into several related concepts that are either offered as parallel or evolved approaches. The two primary divisions being Classical and Constructivist Grounded Theory (Evans, 2013). After some consideration, this study opted to use a method closer to one of the more recent evolutions of Grounded

Theory – Optimal Grounded Theory (Richards & Farrokhnia, 2016), which is more aligned to the Constructivist division.

1.7. Thesis Outline

This first Introductory Chapter is followed by a Research Design and Methods Chapter which will present the Research Design and Conceptual Framework of the study. This Second Chapter reviews the selection of Grounded Theory-like approaches for policy research.

There have been a number of pieces of legislation that have focused on environmental management in general and at least two that have focused on marine environmental management. Chapter Three analyses the additional value of the NEMO White Paper in relation to the existing legislation. Policy and legislation governing the overall management of the ocean and coastal jurisdiction is historically and currently developed by the National Department of Environmental Affairs. The White Paper is then discussed in relation to other environmental legislation developed by the Department of Environmental Affairs. Other South African national departments have not produced polices aimed at the overall management of the oceans. This Chapter also compares the Principles and Objectives of the NEMO policy to those reflected in other country national ocean policies, and to themes contained in global agendas such as the UN Convention on Biological Diversity and the global Sustainable Development Goals.

A common theme in the environmental management legislation that is carried into the Green and White Papers is the reliance on an information or knowledge base on which to make decisions. The status of the publicly funded marine knowledge base and its ability to support the implementation of the White Paper is assessed in Chapter Four. In defining and assessing the South African national ability to produce the information and knowledge requirements that are necessary to implement the NEMO policy, recommendations are offered for publicly funded marine research investment in South Africa.

Chapter Five elaborates on the history and ambition of South Africa's implementation of the Ecosystem Based Management (EBM) approach. The NEMO policy advocates and adopts the ecosystem-based approach to marine management. The concept of EBM for marine ecosystems has been described extensively and is now accepted as a key element of best practice (Sherman, 2014b; Blamey et al., 2014; Selkoe et al., 2015). In setting out to achieve this, there must be collaboration with neighbouring countries whose ocean territories form components of the marine ecosystems shared with South Africa. South Africa's longest regional cooperation in ocean science and management is on the West Coast, and includes Namibia and Angola in various collaborations in the Benguela Current Large Marine Ecosystem (Moloney & Shillington 2007; BCC 2013). The supporting role of the Benguela Current Commission in achieving the EBM objectives of the NEMO policy is assessed in Chapter Five. The outcome of the assessment will define issues for modes of regional cooperation in this system and other systems that involve South Africa such as the Agulhas Current Large Marine Ecosystem on the East Coast. Such a discussion contributes to the strategic planning for regional cooperation, and in particular how such regional collaborations can support EBM.

A fuller discussion on implementing Marine Spatial Planning in South Africa is undertaken in Chapter Six, with an exploration of the decisions and trade-offs that are likely to emanate across the different sectors. In implementing the NEMO policy, multiple objectives will have to be incorporated in the proposed Marine Spatial Planning (MSP) decisions and some inevitable trade-offs balanced. Likely scenarios of multiple objectives are highlighted.

Recommendations on decision criteria that can be used by spatial planning decision makers are developed. This addresses the challenge of undefined decision criteria for selecting among competing options within marine spatial plans. Chapter Six offers decision trees for marine spatial planning, based on criteria drawn from the South African policy context outlined in earlier Chapters. Chapter Six also defines existing and potential industrial sector uses and marine spatial planning considerations for each of the four defined marine spatial planning areas. This analysis offers real world scenarios for South African marine spatial planning decision makers.

Such decisions will be necessary to achieve the NEMO policy strategic objective of enabling environmental integrity to maintain a range of ecosystem benefits. The Policy, however, does not define these broader ecosystem benefits for South Africans. Both the traditional provisioning or exploitation benefits such as fishing and the more recently ecosystem defined benefits such as ecosystem regulation, environmental support and cultural benefits are elaborated on in Chapter Seven. Aligned to this, Chapter Seven provides options for broadening the consideration of South African ocean and coasts ecosystem services and benefits through an exploration of monetary assessments of South Africa marine ecosystems. Consideration and approval of marine spatial plans ultimately will have to evaluate the use and sustainability of marine ecosystem services and benefits across sectors, communities and generations.

Before considering the ecosystem valuations Chapter Seven formulates and categorizes observations from the interviews with key informants. These interviews, while having contributed to discussions of earlier Chapters, are now used to develop a concept map to describe the context of ocean governance in South Africa. An analysis of this context is required in this study as the Green and White Papers on the National Environmental Management of the Ocean and the Marine Spatial Planning Act of South Africa will have to be implemented in the prevailing political and governance national context.

The thesis concludes with Chapter Eight. Chapter Eight summarizes findings in preceding Chapters and concludes by revisiting the Conceptual Framework of the study proposed in Chapter Two. The Conceptual Framework in Chapter Two is refined and presented as a recommended action model for implementation of the South African Policy on the National Environmental Management of the Ocean.

2. Models, Methodology and Methods: Framing the Research Design and Theoretical Framework

2.1. Introduction

Methods Chapters in post-graduate theses are fundamental to academic pursuit because it directly addresses how data sources were selected, results were obtained or observations made. It also provides justification for the boundaries of the study. The purpose for a methods section is to describe what methodological considerations underlie the thesis. Society-related research or empirically rooted studies show a picture of the society under consideration, but it is not necessarily the only or "right" perception of that society. The method section therefore serves two purposes in principle: to enable the reader to assess the analysis and conclusions of the study in accordance with the premises on which they have emerged; and to assess weaknesses as well as strengths of the methods used. Ultimately methods chapters are critical in academia as they describe the conditions and processes that led to the conclusions.

The methodological framing of a study allows other researchers or users of the findings to fully appreciate and assess the potential implications of the findings in their own research or applied work area. In positivistic approaches to science, the descriptions of methods are important as they allow an assessment of the extent to which the study can be replicated. Replicability is valued in positivist quantitative science approaches, and often lends itself more to the natural sciences where the measurement of natural phenomena is more easily replicated (Baškarada & Koronios, 2018). In the positivist science paradigm replication of studies to produce similar results is a measure of the extent to which results and conclusions may be authenticated in pursuit of "universal truths". Studies where such replication of results can be achieved are awarded merit as objective and rigorous and therefore having wider applicability in a variety scenarios (Aguinis & Solarino, 2019). There is however a trade-off that is especially true in social sciences. This is as one deliberately moves away from the context of the study to determine overarching general processes, the outcomes of that study may be less impactful to that case study. A fuller discussion of trade-offs especially regarding research resources, increasing sample size and replicability is offered by Finkel and colleagues. Although their study refers to psychological science, the discussion of trade-offs in developing achievable research programmes is relevant here (Finkel et al., 2017).

At this point a further discussion of the study's interpretation of social research is warranted. Replicability of the research process and results is not the primary objective of this study. The study's objective is to improve the understanding of ocean governance in South Africa specifically towards producing recommendations on effective and impactful implementation. To borrow from the following quote on social research, the value of the study is to improve the "intelligibility" of the ocean governance knowledge area. "The dispute about whether the goal of social science should be predictive improvement or increasing intelligibility is fundamentally a disagreement about the nature, extent, and justification of claims to knowledge. Of course, we'd rather not have to choose between seeking improvement in prediction and making human action more intelligible" (Rosenberg, 2008, p. 243). A description of the study method is important however, as it offers insights into how the results were obtained and provides essential context to the interpretation of these. Critically, the methods will aim to frame the subjective views of the researcher and make these apparent.

The paradigm defining work of Strauss and Glaser in the 1960s (Glaser & Strauss, 1967)[1] could be interpreted as a response to the positivist natural science movement by social researchers to define an objective research methodology that can be seen as acceptable in the positivist domain. Social science has however evolved in the second half of the last century in its ambition to produce engaging research in real world contexts. Gullestrup articulated this as early as 1973, "Social research, which was previously based on an objectivity and neutrality requirement, has in recent years been characterized by an inevitable evolution away from passive and seemingly neutral research towards engaged and active research. Behind this

[1] Ground Theory is a much acclaimed and general research methodology that produces the theory inductively through the progress of study (Glaser & Strauss, 1967).

research, there is a growing recognition among a larger and larger part of the social scientists that while you can give research results the appearance of being neutral and objective, this neutrality and objectivity is in reality an impossibility, so every research effort is characterized by its problematization, its methods choice and final conclusions, which are expressed by the value assumptions that are expressed through the attitudes and ideologies of the researchers involved, as well as being unaffected by the environment in which it takes place" (Gullestrup, 1973, p. 1).

The movement of social science towards more engaging science processes and actionable outcomes has seen substantial developments in the methodologies applied (Harrison et al., 2017). Flyvbjergs 2001 publication on 'Making Social Science Matter' is considered here to be landmark in the evolution of social science (Flyvbjerg, 2001). Flyvbjerg advances what he terms an alternative, more actionable and socially meaningful model to social science: the Phronetic Model of social science. "Here the purpose of social science is not to develop epistemic theory, but to contribute to society's practical rationality by elucidating where we are, where we want to go, and what is desirable according to different sets of values and interests….we must address problems that matter to groups in the local, national, and global communities in which we live, and we must do it in ways that matter; we must focus on issues of context, values, and power, as advocated by great social scientists from Aristotle to Machiavelli to Max Weber" (Flyvbjerg, 2012, p. 5).

The Phronetic Model of social science incorporates four necessary questions "(1) where are we going with this specific problematic?; (2) who gains and who loses, and by which mechanisms of power?; (3) is this development desirable?; and (4) what, if anything, should we do about it?" (Flyvbjerg et al., 2016, 5).
These set of concise questions are presented early in this Methods Chapter of the study as they provide the guiding questions for study. The Research Design presented below and the Chapters that follow are intended to revolve around and answer these questions, with the specific problem area of the study being ocean governance in South Africa. Within ocean governance the Phronetic questions are

targeted at marine spatial planning as the selected vehicle of ocean governance. The outcome of the study aims to answer the Phronetic questions around ocean governance including a determination of the value of ocean governance and recommendations on its implementation, with specific reference to the South African context.

The notion of impactful social scientific inquiry is well articulated by Zyphur and Pierides who argue for a move away from a blind adherence to positivism and the seeking out of such non-real concepts such as objectivity. To quote from their recent paper "The implication is that, for researchers, the fight is not a skeptical [*sic*] one against chance or errors in inference regarding universal or abstract truths; the fight is a fallibilistic one against failures of action in specific material environments….. Quantitative organizational researchers can address this problem of action by looking at what kind of work needs to be done in a specific context and figuring out how quantitative tools may be recruited to help" (Zyphur & Pierides, 2019, p. 10). See also related papers on pragmatic approaches to positivism (Zyphur & Pierides, 2017; Powell, 2019).

This Methods Chapter describes the study as a qualitative inductive one following an interpretive and constructivist epistemology. Realistic description and the development and construction of the theory of ocean governance in general and specifically in South Africa were the planned outcomes of this study. This description must be viewed within the Phronetic model of social research and its four questions described above. The study remains empirical because it is routed in observation of the South African case of ocean governance context, institutions and actors.

The Chapter is divided into three components. The first briefly explores concepts of governance and implementation. This exploration traces the emergence of ocean governance as the primary theme of this study and then illustrates the growing characterisation of implementation theory and research. Included in the thesis title is a focus on Implementation and this component aims to place the study in the current characterisations of Implementation Science. The first component of the methods discussion also incorporates a mapping of the researcher's Conceptual Framework of the study. The second components discusses the evolution of the Grounded Theory methodology including trends and development in Grounded Theory approaches and makes a case for the sub-category of a Grounded Theory-like approach used as the methodology for the study, namely Optimal Grounded Theory. The third component describes the research design and data sources used, including a discussion on the case study approach. The third component illustrates the study's theoretical approach and identifies the key research area or "domain of inquiry" as referred to in Classical Grounded Theory work (Glaser & Strauss, 1967) and also describes the sub areas of the study.

2.2. Theory Perspectives of Ocean Governance, Policy Implementation and the Conceptual Framework of the Study

Modern ocean governance globally has generally followed an evolution similar to that of South Africa, where ocean governance begins with aspects of wild capture fisheries regulation. Generally these aspects of fisheries regulation wanted to promote particular agendas on access to fisheries. These evolved to responsible access to fisheries with considerations of sustainable use. Over the second half of the 20th century, fish were acknowledged as being major components of ecosystems and the impacts of fisheries were therefore considered as important pressures to track and manage (Hilborn, 2004). This led to concerted management efforts in Ecosystem Approaches to Fisheries (EAF). This EAF movement then evolved into Ecosystem-Based Management (EBM) that took fuller consideration of ecosystem dynamics beyond fisheries (Marshak et al., 2017). The United Nations Convention on Biological Diversity (CBD) was also early to adopt an ecosystem approach to environmental management as is evidenced by the CBD Decision V/6 of 2000 – the Fifth Conference of Parties meeting. Still early EBM research and governance was directed at biological functioning. The evolution of EBM then took into account the impact of pollution and this pollution agenda has now grown with efforts from several government and non-nongovernment sectors to focus on plastic, microplastic, other chemical and physical pollution impacts (Halpern et al., 2019).

In this century, EBM includes wider dimensions of ecosystem functioning, services and benefits, including weather, climate and global change (Craig, 2012; Harrould-Kolieb & Herr, 2012; Bonan & Doney, 2018; Gattuso et al., 2018).

Grip, in a 2017 review of international ocean governance, reports on aspects of this evolution and notes that ocean governance practice has over the last few decades moved towards greater coordination across government sector departments and also across countries (Grip, 2017). The driving pressure for coordination and even integration is towards improving management coherence across individual sectors or coastal states. Grip, in the conclusion of the review offers "suggestions for improved marine governance". These are summarized as: improved international cooperation with functional multinational organisations having impactful working mandates from national governments; developing realistic maritime policies with clear targets; improving multi-sectoral coordination incorporating integrated coastal management, marine spatial planning and ecosystem based management; using regional agreements to improve implementation and coordination and coherence in management measures; improving technical capacity for marine assessments; consistency in methods to value environmental goods and services; and using advances in technology for improving and raising communication and public awareness on marine management issues. While Grip's suggestions were discussed with specific reference to international ocean governance they offer a theoretical set of themes that contribute to the Conceptual Framework of this study.

Figure 2 illustrates the Conceptual Framework of the study. The domain of inquiry, as described in Figure 3 is the effective implementation of ocean governance in South Africa. The initial area of investigation assesses whether the Principles; Objectives and Outcomes of the NEMO White Paper policy are valid in terms of its reflection of the core common denominators of National Ocean Policies from other countries and international multilateral agreements. The question investigates whether the NEMO policy has included international ocean governance trends and meets the basic requirements of the South African constitution and other national objectives. This is the topic of Chapter Three and concludes with an assessment of the new or additional value proposition of the NEMO policy in the existing South African environmental management policy context.

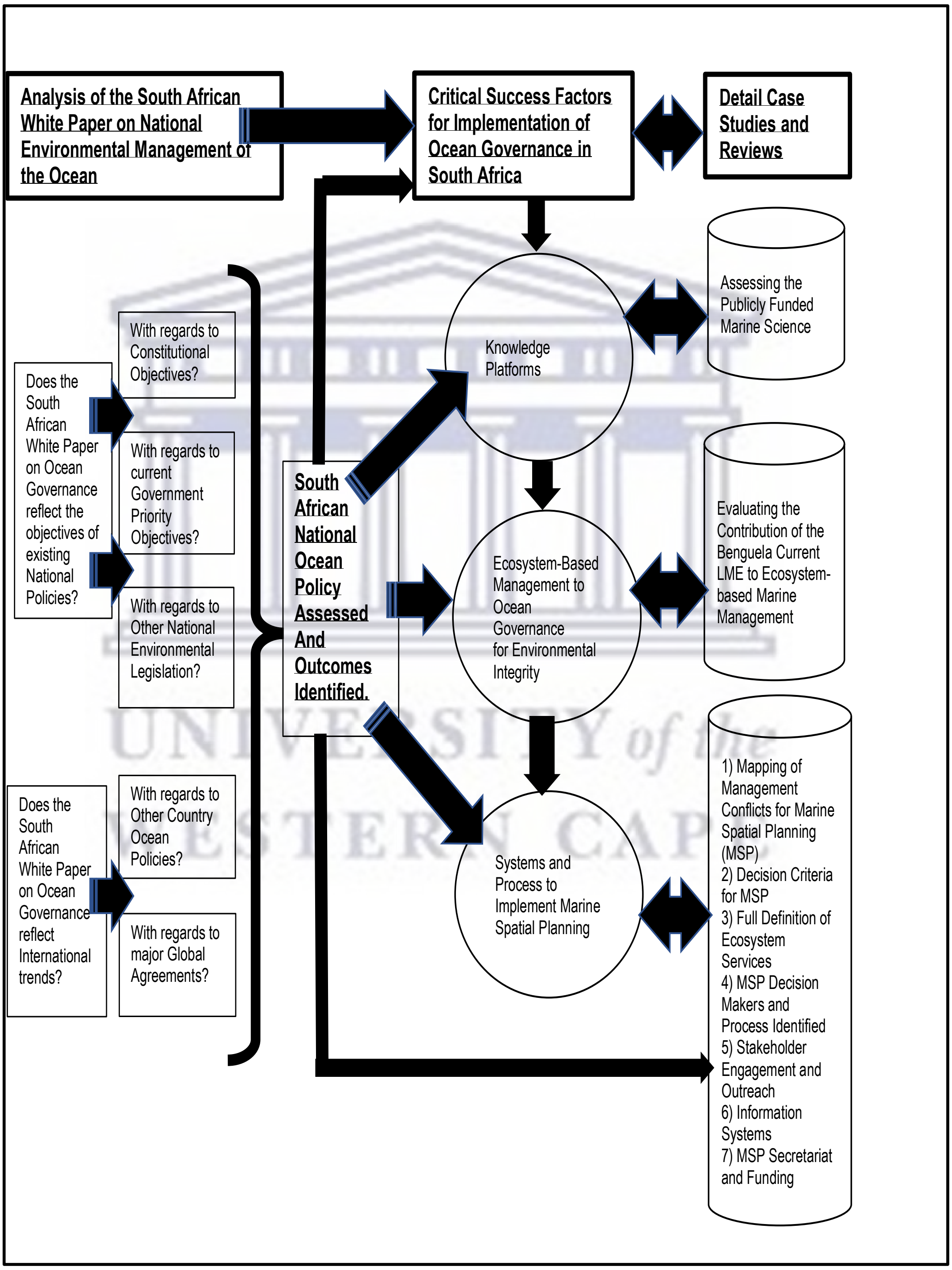

Figure 2. Conceptual Framework for the study on implementing an ocean governance model in South Africa

Nationally any policy must be coherent with the Constitution and other related policies. In the case of the NEMO policy there should be coherence with other national environmental management policies. Additionally, the NEMO policy should support or at least not frustrate South Africa's ambition to grow its ocean economy. While the ocean economy development may not be a formalised policy, it is a specific area of focus within the broader objective of growing the South African economy. This will be revisited in later Chapters, in particular Chapters Six and Seven.

Assessing the NEMO policy with regards to international agreements provides a means to measure if the policy has incorporated what is generally or globally regarded as normative management measures or soft law. Houghton argues that while the legal status of Conference of Party (COP) decisions may be "hotly debated", they do have value and influence in providing a governance framework through articulating overarching governance principles (Houghton, 2014). Like, Grip's (2017) focus on international ocean governance, Houghton also focuses on international ocean governance through focusing on Areas Beyond National Jurisdiction (ABNJ) and identifies candidate principles of governance for ABNJ. These principles add to the evolving theory and ontology of ocean governance and can be categorised into: protection, conservation, cooperation, responsibilities of states including management of their citizens at sea; sustainable and equitable use; transparency in decision making processes; UNCLOS's freedom of the high seas (or limits to this); precautionary approach; ecosystem approach; science based decision making and public access to information. This categorization provided additional support for the areas of focus in the Conceptual Framework of the study.

This initial assessment of principles and objectives of the NEMO policy and how it compares nationally and internationally is followed by assessing the critical areas or success factors that are deduced from the NEMO policy itself. This firstly includes the knowledge platform that exists to support the implementation of the NEMO policy. The NEMO policy argues that ocean management must be based on a knowledge platform as a basis for informed decisions; this is the major input factor into defining management interventions for ocean governance. The detailed investigation in this area describes and assesses the current government investment in ocean and coasts science and identifies strengths and deficiencies.

The major outcome of the NEMO policy is strengthened ocean environmental integrity. The primary mechanism for delivery of this is implementing the ecosystem-based approach to marine management, and in South Africa's case – to sustainable development. The implementation of the Ecosystem-Based Approach is deduced as the second critical success factor supporting the NEMO policy. South Africa's marine ecosystems are shared with neighbouring countries and the High Seas. The detailed investigation in this area focuses on the more than two decades of work and collaboration by South Africa with Angola and Namibia in the Benguela Current Large Marine Ecosystem. This aspect of the study evaluates the outcomes of this collaboration to assess if such a regional or large marine ecosystem approach is an appropriate delivery mechanism for ecosystem-based management in the marine environment for South Africa.

After the detailed investigations of the knowledge base or science platform and the Benguela regional approach to ecosystem-based management that exists in support of ocean governance, the study investigates critical process requirements for marine spatial planning (MSP). Marine spatial planning is the governance vehicle that has been identified over the last two decades as the primary vehicle for integrated ocean management and planning (Young et al., 2007; Foley et al., 2010; Craig, 2012; Jones et al., 2016; Grip, 2017). Marine Spatial Planning has been advocated as arguably the most valuable governance methodology to achieve integrated governance for the ocean. Integrated governance is selected as the only viable solution to realistically planning across ocean user sectors and their various levels of overlap in time and space. Marine spatial planning is the key tool advocated by the NEMO policy to deliver on improved ocean governance; through managing impact, implementing an ecosystem-based approach and promoting sustainable use. Processes to support MSP in South Africa is deduced as the third area of critical success factors required for successful implementation of the NEMO policy. In order for MSP to be effectively implemented, the decision criteria and processes across overlapping sectors of use must be made apparent; this is included in the discussion on MSP for South Africa in Chapter Six. Similarly, MSP discussions and decisions must be made in the context of a broader and more complete appreciation of ecosystem services offered by oceans and coastal ecosystems. A valuation of marine ecosystems of South Africa is made in Chapter Seven, towards supporting a more complete appreciation of all of the ecosystem benefit categories that must be included in selecting spatial planning scenarios.

The ocean governance and marine spatial planning context is discussed and mapped in Chapter Seven. This is offered in terms of describing the real-world challenges of implementing a coordinating environmental management tool such as MSP in the legislative and government administration context of South Africa. Case studies of marine spatial planning note that implementation context is important for marine spatial planning success (Stelzenmüller et al., 2013; Taljaard & van Niekerk, 2013; Mills et al., 2015; Jones et al., 2016; Buhl-Mortensen et al., 2017). There are various details in the specific governance contexts of marine spatial planning sites that force adaptation of the generic approaches to marine spatial planning.

The conclusion of the study, Chapter Eight, revisits this conceptual framework in Figure 3 to revise it through theoretical conjecture and presents a model for implementation of Ocean Governance Policy in South Africa. The Ocean Governance Policy in South Africa progressed from the publication of the Green Paper in 2012 to the White Paper in 2014 and the gazetting of the Act in 2019. Coincidently, over this policy development process, there appears to be a growing appreciation that there is scope for an unfortunate divergence in the conceptualization and implementation of marine spatial planning. This largely relates to the processes of implementation that may insufficiently include all governance stakeholders and participants, especially those outside government (Flannery et al., 2016; Tafon, 2018; Flannery et al., 2018; Kelly et al., 2018; Clarke & Flannery, 2019; Flannery et al., 2019). Chapter Eight includes in its consideration this potentially new postmodern era of marine spatial planning.

Before proceeding to the discussion of the Grounded Theory Approach, it will be necessary to focus on the current research into implementation theory. The objective of the research study undertaken here is to provide insights into effective implementation of the South Africa White Paper on Ocean Governance – NEMO. Effective implementation is this study is defined as the Policy being implemented in a manner that meets the objectives of the NEMO Policy. These objectives are discussed later in Chapters Four, Five, Six and Seven. Research in implementation science sees the evaluation criteria and systems as only one dimension of implementation, and includes the other dimensions of why and how implementation of some polices succeed and others do not.

Recent guides and studies on implementation science describe that implementation science appears to coalesce around the terms theories, models and frameworks. These are used interchangeably. Per Nilsen in the latest Handbook on Implementation Science summarizes the aims of implementation theories into three areas: describing and/or guiding the process of translating research into practice; understanding and/or explaining what influences implementation outcomes; and evaluating implementation (Nilsen, 2020). Within the first area Per Nilsen categorizes Process Models; Determinant Frameworks, Classical Theories and Implementation Theories are defined within the second area; and Evaluation Frameworks are defined in the third area. The context in which implementation occurs and its influences on the implementation process and outcomes is highlighted in the Per Nilsen and other implementation science reviews (Cairney et al., 2013; Nilsen, 2015, 2020; Nilsen et al., 2019; Signé, 2017). This adds to the motivation for the focus of this study on the context in which ocean governance will be implemented.

Of the five Per Nilsen (2020) categories of implementation theories, this study is most aligned to the Process Models. Process models provide steps or areas of work, that through their attainment, will support the implementation of the policy. The Conceptual Framework presented in Figure 2 includes the success factors for

Ocean Governance Implementation, and these may be viewed as the action steps in implementation process models. The National and International policy influences and desired outcomes could be viewed as the Determinant Frameworks or policy context of ocean governance. The Conceptual Framework in Figure 2 combines implementation models and determinant framework maps illustrated by Bullock and coworkers in their interpretative analyses of implementation of evidence-informed policies and practices (Figure 2 & 3, Bullock et al., 2020).

Policy implementation is a dynamic process, where success is rooted in the context, supporting mechanisms and responses of the various human actors. Ocean governance is a social objective and marine spatial planning is a societal tool.

2.3. The Grounded Theory Methodology

Grounded Theory, has been promoted as an appropriate methodology to undertake social research with the output of such research being to develop or arrive at theory that may be applied to "detection and explanation of social phenomena" (Haig, 1995, p. 2). The Grounded Theory concept is classified into Classic Grounded Theory (Glaser, 2014b) and the other more structured approaches such as Qualitative Data Analysis and Constructivist Grounded Theory (Corbin & Strauss, 1990; Charmaz & Bryant, 2010).

Using an approach based in Grounded Theory, the study identified, through the systematic emergence, common denominator objectives for ocean governance policies and a set of critical success factors for the implementation of ocean governance. This emergence requires a balance of having an initial framing conceptualization and thereafter undertaking iterative cycles of developing and refining the initial conceptualization through document analysis, interviews and observations (Glaser, 2014b). Classical Grounded Theory, in my opinion, espouses to the truest form of discovery research, because it suggests that the researcher must not be encumbered by pre-conceived opinions as this will narrow the discovery process. Although having no preconceived notion of the subject matter is not possible when the researcher has been working as a practitioner in the field of study. This is very much the case in this study and the researcher/student's experience is discussed below in section 2.3.3. Even without a professional association, the researcher will have an archive of literature and experiences that will be brought in the research process, including in formulating the research question (Elliott & Higgins, 2012). Critical to implementing such research is remembering to be inclusive and not being tempted to look for confirmation of preconceptions in the data gathering processes, which will prematurely and artificially close off exploration. The Classical Grounded Theory (CGT) option for a researcher/student who is working in the field of study from day to day; is a daunting one, as CGT asks that you allow yourself "not to know" as you begin the study. Other researchers, especially those who advocate the various forms of Constructivist Grounded Theory, argue that most researchers will begin a study with some knowledge and insight; and hence in practical terms the philosophy of the Classical Grounded Theory is not realistically possible (Urquhart & Fernandez, 2006).

The forms of Grounded Theory are concisely and accessibly described by Evans who provides a 'Walk Through' Grounded Theory for the novice (Evans, 2013). From the early beginning of Classic Grounded Theory in the 1960s, it has evolved to being used in a much wider array of sciences than its initial use in the human behavioural and psychological studies. The evolution is as a result of researchers developing the approach to be more or less formalized and prescriptive according to their interpretation of the Theory and its use in their discipline. Generally, Grounded Theory proponents argue that it can be used across a variety of disciplines, especially where there is a lack of existing theory (GetanehAlemu et al., 2015).

Richards and his co-author argue that what they define as Optimal Grounded Theory (Optimal GT) is most suited to policy research, in that it can provide solutions to address policy gaps and recommendations on practical implementation (Richards & Farrokhnia, 2016). The research outcome of practical implementation is sought after in this study with regards to ocean governance in South Africa. The approach in the study draws much from the process described by Richards and Farrokhnia, which builds on the Constructivist Grounded Theory approach (Charmaz & Bryant, 2010; Charmaz, 2014). Constructivist Grounded Theory calls for a more structured approach to the investigation and formulation of emerging concepts. Emerging concepts are observed through continuous interaction with interviewees and other sources of data. Charmaz, a strong proponent of the Constructivist Theory usage, promotes this category of Grounded Theory as an effective means to test world views that encourages the researchers to question assumptions and perspectives throughout the course of the investigation (Charmaz, 2016, 2017, 2020). All Grounded Theory includes a series of iterative steps of looking for patterns in observations through coding, ordering, and re-coding and re-ordering until the very basic relationships or processes are discovered, and decisions are made on which learning can be applied across individual cases or contexts. This study relies very much on the analysis of formal published government literature such as Acts; policy documents; government and other non-government strategic plans, business plans and annual reports. The Richards and Farrokhnia (2016) study focused on the analysis of World Trade Organization E-Commerce Polices and involved the analysis of published documents. In their study, they proposed their Optimal Grounded Theory method as a tool for policy research where the basic philosophies of Grounded Theory are applied. This application occurs in a structured process or organization of research questions and data so that policy solutions emerge or are discovered in the context of real-world questions or issues that require solving. The Research Design of this Project is described in Figure 3 and the Conceptual Framework to this study is described in Figure 3. The Conceptual Framework aims to place the study in a real-world context so that observations and analyses can be relevant to the implementation of ocean governance policy in South Africa. The Conceptual Framework in Figure 2 also illustrates the researchers initial conceptualization of the study domain that is subjected to the constructivist and optimal grounded theory process. The outcomes of the study, like those of Richards and Farrokhnia (2016), are intended to make a "positive" contribution to a real world context - ocean governance in South Africa.

In the early stages of the study "positive" was not defined beyond improving the ease with which government can implement the White Paper on the National Environmental Management the Oceans. As in the case of most post-graduate studies, where there is investment in understanding the details and interpretation and re-interpretation of assumptions, the initial planned focus and outcome of the study was redesigned to some extent. The initial outcome, of how to implement the policy, was eclipsed by the more fundamental questions. Essentially, as the study progressed, there was a growing recognition of the importance of the Phronetic questions around: Where is the policy going?; Are the outcomes desirable?; Who are the winners and losers?; and What are the power dynamics and relationships? These fundamental questions focused on understanding the governance context in which ocean governance and specifically marine spatial planning will take place. A pre-requisite to successful and impactful implementation of the Ocean Policy is the understanding of the ocean governance context in South Africa. The governance context of government priorities and citizen expectation was then added as a layer of analyses and discussion to the study.

While Optimal Grounded Theory is used in this study, the basic criteria of Classical Grounded Theory as described by Evans (Evans, 2013) are retained as the process and objectives of this study: Fit; Understandability; Generalizability and Control. The researcher/student retains these, as they remain a test for the practical solution-based objectives of the study. The concept of generalizability is further discussed in the section on the case study approach below.

The Optimal Grounded Theory model of knowledge building through policy document analysis proposed by Richards and Farrokhnia is the primary research method of this study (Richards & Farrokhnia, 2016). This methodological framework is then merged and matched with the output of Classical Grounded Theory as summarized by Evans' basic criteria described above (Evans, 2013). Following from the merging of the two methodological approaches, the output of the study would be a description of and considerations for Ocean Governance in

South Africa and could have general applicability and offer considerations to a wider range of ocean governance implementation scenarios and cases.

Optimal Grounded Theory (OGT) approach is selected for this study as it allows for the construction of a systematic framing to the study, as opposed to pure Classical Grounded Theory which requires a fuller more open-ended approach which may sometimes lead to initiating parallel enquires. These parallel investigations may not return impactful relevance to the study area. Optimal Grounded Theory falls within the Constructivist Grounded Theory as it allows for some structuring of the enquiry (Sebastian, 2019).

Undertaking a Grounded Theory study to understand a social phenomenon does not have to be restricted to qualitative or quantitative data gathering. This study used a combination of quantitative and qualitative data gathering, and this does not necessarily mean that a mixed methods approach was implemented. Mixed methods, as an approach, has been formalised into an approach in its own right and in stricter definitions does require a fuller integration of quantitative and qualitative methods in data sourcing and analytics (Creswell, 2014). While analyses of key documents in the study used quantitative data gathering exercises such as counts of how many concepts or themes were reflected across policies, the study followed a qualitative approach in determining and categorizing these concepts and reflections. The study then can be categorized as a qualitative study with aspects of quantitative data gathering exercises. An inductive and interpretive epistemology is pervasive in the study in determining and refining concepts and sub-concepts, through iterative coding and engagement with the data sources. In using the inductive processes the saturation measure was observed. Saturation is achieved in quantitative analyses where additional data sources and coding continue to return the same emerging concepts (Mason, 2010; Saunders et al., 2018).

The primary source of data were policy documents and these were substantiated with interviews with key role players, stakeholders or informants in ocean governance implementation in South Africa and the Benguela region and observations made during government led ocean governance and marine spatial planning engagement meetings.

2.4. Research Design

The study focused on the assessment, analysis and implementation of the South African Policy on the National Environmental Management of the Ocean (NEMO). The assessment component measured the extent to which the policy reflected international trends and national government objectives. The analysis aspects of the study reflected on identifying critical supporting and underlying criteria and mechanisms that will be needed to implement the policy. The study used an approach of coding or identifying principles and objectives for environmental governance to determine how they are reflected in the NEMO White Paper Policy. A similar approach had been employed to review the South African Integrated Coastal Management Act of 2008 and to compare it to previous Acts that incorporated coastal management functions, including those that existed previous to post -1994 democratic era (Goble et al., 2014). This approach was expanded to determine how the NEMO policy reflects recurrent themes identified in ocean governance policies from other countries and from global multi-lateral conventions. The methodology primarily incorporated research activities similar to the Constructivist Grounded Theory Approach (Charmaz & Bryant, 2007; Birks & Mills, 2015). These include an appreciation that the study begins with a platform of inductive knowledge and moves through analytic processes of coding towards producing a research outcome that advances theoretical construction within the domain of inquiry (Sebastian, 2019). Notably, unlike positivist approaches the research question is not framed as a hypothesis to be proven or disproven but the science process allows for theoretical or abstract conceptualizations (Charmaz & Bryant, 2010).

Similar to other Grounded Theory approaches, the Optimal Grounded Theory method is initiated through a central question or concept. Figure 3 illustrates the research design for the study, adapted from the research structure for Optimal

Grounded Theory presented in Richards & Farrokhnia, (2016). The Figure, additional to the Richards and Farrokhnia study, also includes the data sources used. A detailed description of data sources and sampling is provided below Figure 3.

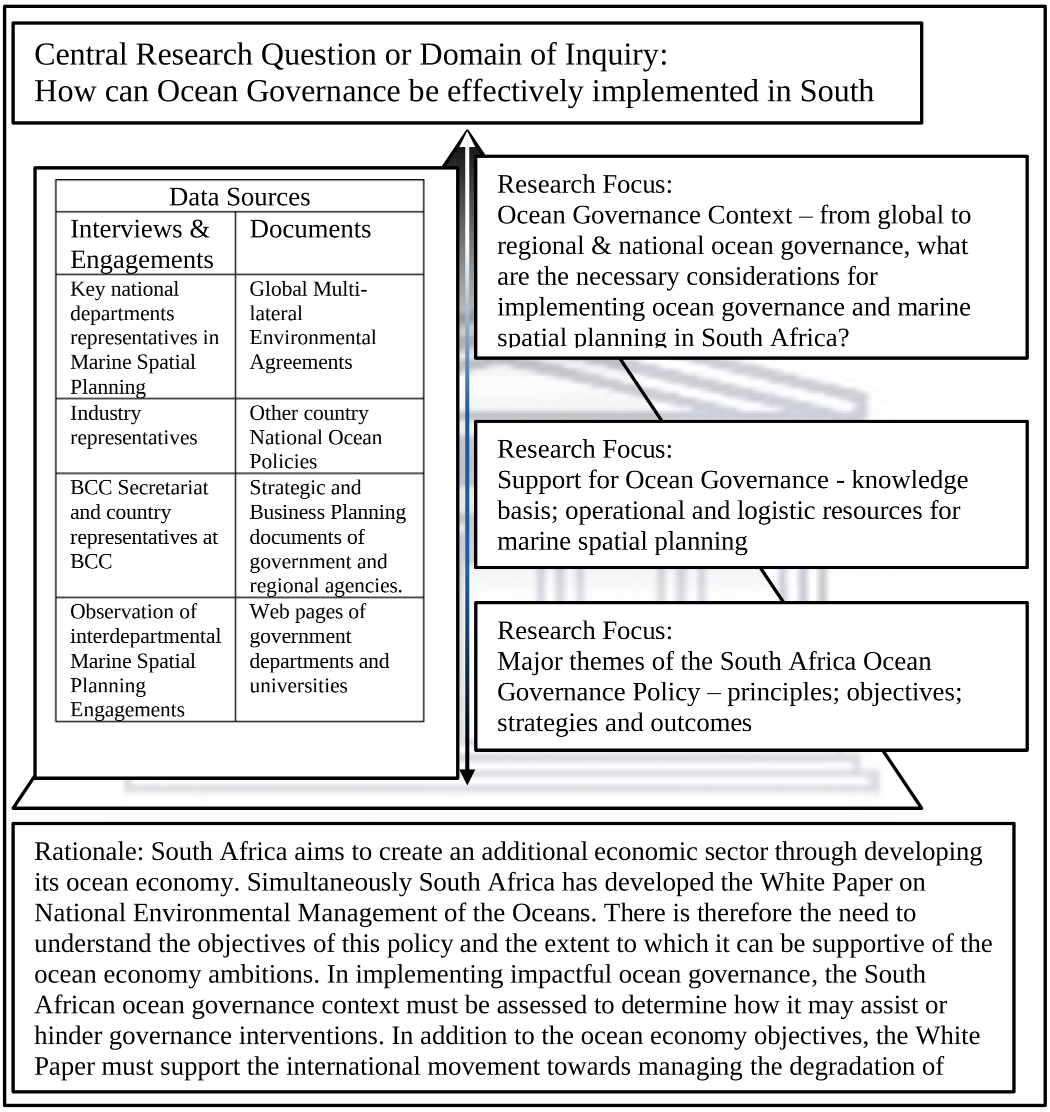

Figure 3. Research Design for the study into implementation of Ocean Governance in South Africa. Adapted from Richards and Farrokhnia, 2016)

The research design of the study revolves around the central concept of "Effectively Implementing Ocean Governance in South Africa" – from assessing the Principles and Objectives of Ocean Governance to practical implementing steps. The primary question is: What are the critical implementing elements or steps for the successful implementation of the South African Policy on National Environmental Management of the Oceans (NEMO)? This central question then leads to a few higher order categories of explorations or research foci that are investigated in greater detail in the development of the policy, its supporting platforms and overarching implementation context, including government priorities.

2.4.1. Document analysis and Literature Review

This aspect of the research reviewed and analysed published government policies, documents and other related literature. The primary source of data was the published policy and strategy papers at the national, regional and global scales, workshop reports and presentations. Among others, the key published documents were the South African Green (NEMO, 2012) and White (NEMO, 2014) Papers on the National Environmental Management of the Ocean and the South African Marine Spatial Planning Act (MSPA, 2019). In undertaking the literature review of the relevant documents the 'Grounded Theory Literature Review Method' (Wolfswinkel et al., 2011) was used as a basic method to interrogate the literature. This method proposes a five-stage process of Define; Search; Select; Analyse and Present. Employing this method advocates for realistic and necessary processes of iteration in the coding steps.

Other primary documents analysed for the implementation of eco-system based management at the regional scale included the Strategic Action Plan of the Benguela Current (BCC, 2014) and the Benguela Current Commission Convention (BCC, 2013). These documents set out the objectives and key performance areas of the Commission.

The South African National Ocean Economy aspirations was sourced from the published projects from Operation Phakisa: Unlocking the Economic Potential of South Africa's Oceans (DPME: Operation Phakisa, 2018). The objectives of the NEMO White Paper and the economic sector targets identified in these projects were used to determine the multiple objectives for marine spatial planning in South Africa. Documents describing outcomes and objectives of major global sustainable development multi-laterals were also investigated including the United Nations Convention on Biodiversity and the Sustainable Development Goals.

The data analysis approaches to the document texts are described in detail in the following Chapters, including coding categories that formed that basis of assessment. Chapters Three, Four, Five and Six extensively interpret and assess the selected documents to determine and conclude on dominant themes and how they are represented. Allocating scores to assess the extent to which documents reflected each other's texts used direct word linkages i.e where documents used identical or similar words or phrases, these were assessed as being reflective of the concept. Where direct word associations were not possible, a qualitative assessment was made on the interpretation of the text, and these instances are noted in the analyses where this was necessary. Such an approach to document analyses raises the question of quality (importance) of inclusion verses the quantity (number of times) of inclusion. This method in particular is used in Chapter Three in the analyses of the extent to which the South African White Paper Policy on the National Environmental Management of the Ocean reflects the concepts identified previously. The analyses of the White Paper is restricted to the text's Priority Statements and does not include introductory or explanatory notes. As such all Priority Statements are taken to be equal. The White Paper does not specify any categorization or emphasis within these Statements. The quantity criteria within these Statements are therefore interpreted as a valid measure of the extent of inclusion.

Further details on the data sources and methods used have been provided, where required, within each of the following chapters. Document analyses included web-pages where other sources of documents were not available. In particular web-page analyses were used in Chapter Four to determine how universities profiled ocean and coasts research and teaching programmes.

2.4.2. Interviews

In addition to the literature and document analyses, interviews were undertaken with key informants from government, regional and non-governmental organizations dealing with ocean policy development and implementation. Such interviews with ocean governance policy developers and implementers were held to determine and interpret policy direction and considerations made during implementation. The selection of interviewees was purposive and targeted key informants that had at least some part of their job requirement associated with ocean governance or marine spatial planning. Interviews with such purposively selected informants allowed for a hermeneutic dimension to be incorporated into the study. The hermeneutic dimension arises from a perspective that developing and implementing ocean governance in South Africa will have some context peculiarities. Ignoring this contextual uniqueness will have unintended consequences and may frustrate the governance processes. This phenomenology of context appreciation and hermeneutics is acknowledged and concisely explored by Samanta in her exploration of transformative governance of the Cuyahoga River in the USA (Samanta, 2018).

All of the government employed informants were at the level of senior managers. This category of employment in the South African context includes employment levels of 13, 14 and 15 and are named Director, Chief Director and Deputy Director General. National Department representatives on the interdepartmental National Marine Spatial Planning Committee were targeted, and most interviews took place at the margins of these Committee meetings. Interview duration was 45 minutes to an hour. While the majority of the represented Departments were interviewed, representatives from one, of a possible total of six participating Departments, could not be interviewed. The six participating Departments included Fishing, Mining, Transport, Tourism, Science & Technology and Environmental Affairs, with Tourism not being included in the interviews owing to unavailability. The Department of Defence, although a participant in the MSP Committee and process, is not included as generally ranking officers do not participate in interviews. Industry representatives were also targeted and office bearers representing three fisheries industry sector associations were interviewed. South Africa does not have industry representative associations for offshore mining and ship owners. Regionally, country representatives at the Benguela Current Commission were targeted and at least one representative per country was interviewed. Two senior staff of the Benguela Current Commission Secretariat were also interviewed. Additional to the core set of identified key informants, interviews were undertaken with senior staff involved with ocean policy development and implementation in Department of Environmental Affairs, these included permanent staff and contracted consultants. A total of 21 interviews were completed, Table 19 contains a categorization of key informants, and is attached as Appendix 4. While two interviews were undertaken with employees from the offshore mining industry, these individuals were not prepared to provide input in their official capacities or sign the University approved consent form which includes personal details.

Senior staff were interviewed because the researcher/student is a senior manager in a National Department. Interviewing lower levels of staff could have introduced power dynamics into the interview process, thereby biasing the interview information/results and making interpretation difficult. Interviewees therefore were selected mainly on the basis of being at a peer or higher level. The interviewer/student acknowledges that only interviewing senior staff will have biased the insights towards management considerations. Junior staff may have offered more focused insights and practical implementation challenges in their spheres of work.

The questions raised during the interview reflected concepts in the Conceptual Framework illustrated in Figure 2. These included aspects of the value of the Ocean Policy, overlaps with other legislation; the need for marine spatial planning, the envisaged process of MSP, regional implications and stakeholder engagement. The questions were framed only to introduce the concepts and the interviewee was then allowed to elaborate in any chosen direction (i.e. a semi-structured and open-ended approach). While the original intention was to record the interviews, it was deliberated that senior managers may be less constrained with their responses if interviews were not recorded. Notes were made during each interview. Immediately after the interview additional notes were made including initial open ended memo-ing on categorizing major concepts.

Agreeing with the Classic Grounded Theory approach the interviewer/student, remained open to receiving perspectives and associations from the interviewee and the interview process (Glaser, 2014a). The interviews were semi-structured (Smith, 2018), and while a set of questions were prepared, not all of the questions were posed to every interviewee, and this depended on the discussion. This approach also allowed emergence of the interviewee's prioritization order and observations of how relationships across various concepts or issues are constructed by the interviewee. Such semi-structured approaches are well suited to case study research (Yin, 2009). Open-ended approaches allow constructs and associations to be developed by the interviewee and limit the extent to which the interviewee reacts to established constructs of the interviewer. The Interview Consent Form and Questionnaire (or question guide) are attached as Appendices 7.2 and 7.3.
The data from each interview was analysed individually through a series of initial coding steps. All interview responses were then coded through open, axial and selective coding. Two dimensions of ocean governance emerged through the coding processes: dominant concepts in ocean governance and associations, constructs and hierarchies across these concepts. An ocean governance context emanating from the interviews is mapped in Chapter Seven.

In addition to interviews the researcher attended six meetings of the National Working Group on Marine Spatial Planning. These meetings are coordinated by the Director for Ocean Conservation Strategies within the Department of Environmental Affairs. The attendees of the meetings are appointed by Directors General of participating Departments as members of the meeting in capacities to represent their sector departments in the marine spatial planning processes. Meeting attendance by the researcher/student was intentionally restricted to opening and closing sessions of the meeting which generally ran over two days so as to maintain an observer status. This measure was used so as to not influence the meeting discussions as an active senior manager within government. Meetings that were selected for attendance by the researcher/student primarily focused on the MSP processes such as the logistics around developing the first marine spatial plan; site selection, data source selection, zoning process considerations and how data is to be shared across sector departments. Two regional marine spatial planning meetings and one national coastal management stakeholder consultation meeting were also attended. The regional planning meetings were arranged by the Benguela Current Commission, and the meeting focused on marine spatial planning in Angola Namibia and South Africa. A list of meeting and dates attend is attached in Table 20 as Appendix 7.

2.4.3. Institutional and organizational memory – a note on the researcher/student

As a senior manager currently employed within the South African Government, the student used and incorporated into this study his operational knowledge and institutional memory. This knowledge has been gathered experientially from twenty years of working on ocean governance, science and related issues. While some approaches to research may impose a restraint on the use of this experience to guide the study, this experience is used to add to the study through contributing to the selection of the study focus areas and add to the interpretation of analysis. The researcher/student currently holds the position of a senior manager (Chief Director) of ocean and coasts science programmes in the South African National Department of Environmental Affairs (DEA). This position is held after middle and senior programme manager positions were held in other science and policy aspects of ocean governance. The researcher/student also previously worked as a mid-level science manager for coastal process (physics, chemistry, microbiology) studies at the South Africa Council for Scientific and Industrial Research (CSIR). His formal studies were in marine science and ichthyology and he initially worked within the national government fisheries stock assessment science group (Marine and Coastal Management - MCM). During these previous positions and roles, in particular in the management functions, the researcher/student was exposed to and involved in many strategic and operational documents and discussions. The strategic documents of the DEA, MCM and CSIR are all public domain documents, as these are government and publicly funded agencies. The discussions that the researcher/student participated in as a result of the various positions he held previously or is holding currently have added, consciously and unconsciously, to the interpretation of the documents. As a senior manager the researcher/student represents the DEA on various steering and oversight committees relating to marine science programmes, all of which are in the natural (biological, physical and chemical) sciences. This includes his role as a non-Executive Board Member of the South African National Space Agency, currently serving in his second and final three-year term.

The precaution that has been attempted, in the use of such experience and institutional memory, has been to maintain objectivity and professional disinterest in the process of analysing issues that are directly and indirectly within the domain of previous and present employment. Here, the critical interaction with and guidance by the two supervisors helped to alleviate bias. Thus in constructing conceptualizations and concluding on recommendations for ocean governance, the researcher/student combined observations from the document analysis, interviews, engagements and personal experience.

Areas of the study where the researcher's personal experience was particularly relevant relate to the mapping of publicly funded marine natural science programmes. In his current and previous roles the researcher/candidate has detailed knowledge of objectives, budgeting and operations of ocean and coastal science programmes. These programmes are discussed in Chapter Four.

The researcher/candidate was also nominated as the marine protection and governance laboratory coordinator of the Operation Phakisa: Oceans Economy Programme in 2014. This Programme is described and discussed in Chapter Six. The laboratory coordinator was tasked with compiling and presenting detailed implementation project plans gathered from a range of national experts and practitioners across the fields of compliance, enforcement, marine protected areas, environmental legislation, applied information systems and governance. This was a six week intensive exercise that produced plans that were to be implemented from 2015 to 2020.

While the researcher had detailed knowledge of aspects of operational areas of ocean governance and science, independent and publicly available sources of all information used in this study are included and referenced in the study. Particular effort was made to use references and mapping for existing and potential uses of oceans in South Africa that are currently in the public domain.

This description of the researcher/student's role is provided as it must contribute to both the technical information base but also to the human values platform on which the research was undertaken. While the discussion of values and social research is not undertaken here, the following statement ventilates the idea "One of our positions was that in order to take ethics seriously, researchers need to understand scientific practices as value-laden instead of value-free" (Zyphur & Pierides, 2019, p. 1).

2.4.4. The Concept of Case Studies

The use of case studies in research, while having fell out of favour during the height of the positivist research rise in the middle part of the 19th century, experienced something of a comeback through the defining of Grounded Theory which offered a process of inductive analyses. Today case study research is used in a variety of fields. Case studies are employed to improve intelligibility and insight into complex phenomena involving identity, individual, human, community and institutional issues within specific contexts (Harrison et al., 2017).

The study can be viewed as a case study of ocean governance policy development and implementation in South Africa. An alternative way to view the study is as a nested set of case studies, with all sub-studies contributing to the discussion on ocean governance in South Africa directly, with some inferences on considerations and dynamics across national, regional and global ocean governance. In undertaking case study research towards describing and understanding a particular context, an is the case in this study, illustrating a clear theoretical framework is important (Yin, 2009). The Theoretical Framework presented in Figure 2 describes the various sub-studies towards the framing concept of ocean governance in South Africa.

Chapter 5 represents the obvious use of a sub-case study in the assessing the working of the Benguela Current Commission and its realized and potential support for implementing the ecosystem-based approach to marine management. Chapter Six could also be viewed as the use of case studies. Description of the four marine spatial planning areas can be seen as specific sub-case studies, while sector interaction analysis is an illustration of one interpretation of the relationships across these sectors. All of the Chapters lead to the outcomes of the study in Chapter Seven and Eight. Chapter Seven provides a view of the ocean governance context in South Africa. This is provided to illustrate the observed key concepts and provide insights on the relationships between these concepts that emerged through the study. Chapter Eights returns to the Phronetic outcome and questions of the study by providing considerations on the policy direction, desirability and operationalization?

Case studies are often used in social research as a necessity towards exploring, describing and theorizing about issues in context. Flyvbjerg articulates this most succinctly “Context-dependent knowledge and experience are at the very heart of expert activity. Such knowledge and expertise also lie at the centre of the case study as a research and teaching method; or to put it more generally, still: as a method of learning. Phenomenological studies of the learning process therefore emphasize the importance of this and similar methods: it is only because of experience with cases that one can at all move from being a beginner to being an expert” (Flyvbjerg, 2006, p. 5). In the same paper Flyvberg discusses the five misunderstandings that have unfortunately caused scientists to move away from case studies as a methodology. Here he argues that in addition to providing the depth of knowledge as a foundation for “expert” level thinking on subject matter within the context of the case study, case studies can be used to generalise across case studies. Learning across case studies is also supported by Ruddin, who used “war case studies” as an example (Ruddin, 2006).

There is much debate about extrapolating the insights, intelligence and learnings from case studies to draw conclusions on the generalizations and underlying "truths". I agree with the idea that innovative thinking and learning requires in-depth "case study level" knowledge of phenomena. This however may not be generally pervasive as described in a study of the top 20 management and business journals covering 2002 to 2011, where case study science publications did not show an increasing trend, and actually observed a decreasing trend of a low base of 5.3% (Runfola et al., 2017). These debates, are not the focus of the study, which is intended to be an in-depth examination of ocean governance in South Africa. Learning across case studies is possible when processes on data sources, data gathering, analytical techniques are illustrated fully and multiple data sources are used to improve triangulation (Yin, 2009). This Chapter and its discussion of the model, methodology, research design, data sources, and theoretical and conceptual framework provides the context in which the discussions and findings of the study can be interpreted.

3. Building of An Ocean Governance Approach: Ocean Governance Themes in South Africa

3.1. Introduction: The White Paper on the National Environmental Management of the Ocean

In 2010, the Presidential macro-reorganization of the South African National Departments resulted in the Department of Water Affairs and the Department of Environmental Affairs existing as two separate departments within the Ministry of Water and Environmental Affairs. The Branch Oceans and Coasts was created in the Department Environmental Affairs (DEA). For the first time in South Africa's history a high-level government unit was created with the directed purpose of conservation and sustainable development of the Ocean and Coasts Ecosystems of South Africa. A Branch level unit is headed by a Deputy Director-General and reports to the Director General who is the highest executive below the Minister presiding over a Department. Hence the profile of oceans and coasts environmental management was raised within the DEA as a defined and focused performance area. Very significantly during this creation of the Branch; the fisheries management function including research and compliance was moved out of the Department of Environmental Affairs to the reconfigured Department Agriculture Forestry and Fisheries (DAFF). Previous to March 2010 the Branch Marine and Coastal Management (MCM) existed within the DEA and undertook the two major governance objectives of marine conservation and fisheries management. While the separation of this function to the DAFF saw the majority of funding and staff move to away from the DEA; this did allow for a consolidation of the conservation and sustainable development agenda for marine ecosystems outside the busy fisheries management functions.

The general elevation of the profile of environmental management in the South Africa was further developed in 2014 when the DEA was awarded its own Ministry separate from that of Water Affairs. Since 2014 the Environmental Affairs Portfolio has enjoyed the attention of a dedicated Minister and Deputy Minister that was not shared with other portfolios as was the case previously with either Tourism or Water Affairs.

In the first strategic plan of the Branch Ocean and Coasts published in the 2010-2011 financial year and covering the period 2010 to 2015, the target of developing a National Oceans Strategy was identified (DEA, 2010). The emphasis on Ocean management followed the Integrated Coastal Management Act (ICMA) being gazetted in 2009. The Department of Environmental Affairs, within 3 years of establishing the Branch, published the Green Paper on the National Environmental Management of the Oceans and Coasts in 2012. Two years later in 2014 the Department published the White Paper on the National Environmental Management of the Oceans and Coasts (NEMO).

This White Paper was drafted against the legislative landscape of the already existing National Environmental Management Act of South Africa (NEMA, 1998); the Marine Living Resources Act (MLRA, 1998); the Integrated Coastal Management (ICMA, 2009); the Biodiversity Act (NEMBA, 2004) and the Protected Areas Act (NEMPAA, 2004). The ICMA, NEMBA and NEMPAA are all published as Specific Environmental Management Acts (SEMAs) within the framework of NEMA.

This Chapter analysed the strategic priorities of the NEMO policy and evaluated the extent to which this adds to the policy and environmental management objectives that already exists in the legislation. In doing this, a selection of national ocean governance policies from other countries was interrogated to establish common themes or approaches to ocean governance. This allowed for the assessment of the NEMO policy in terms of consistency with international ocean governance norms, direction and best practice.

The Ocean Governance Green Paper lists a collection of ocean governance policies of several countries that it examined to determine commonalities. This same selection of national ocean policies was analysed to comment on the similarities; completeness and categorization or ordering of priorities and objectives as described in the Green Paper. The extent to which these have been reflected in the White paper have also been evaluated.

Additionally the Green Paper presented a summary of the emerging global ocean governance agendas through tracking key concepts in various global agreements. The NEMO White Paper was also assessed to determine how these objectives are incorporated.

The Chapter concludes with an evaluation of the new and value added environmental management propositions of the NEMO White Paper and identifying any areas that are evident in international trends and global agendas that are not addressed, including comments on requirements for implementation.

3.2. Research Methods

A qualitative document analysis (Cho & Lee, 2014) of the South African Green and White Policy Papers on Ocean Governance was undertaken. This document analysis was then extended to National Ocean Policies of Australia, Brazil, Canada, China, Colombia, India, Japan, Norway, Portugal, Russia and the United States of America to determine common objectives. The NEMO White Paper was then assessed and scored for its inclusion of these common objectives.

The strategic priorities of the NEMO policy were also compared to the major international environmental multi-laterals to ascertain how the policy incorporated the established and emerging themes from such forums as the Rio Declaration of 1992, the Johannesburg Declaration of the World Summit on Sustainable Development of 2002; the Rio+20 Earth Summit in 2012, the major objectives and recent decisions of the Convention on Biological Diversity and the Sustainable Development Goals (SDGs). Policy directions from each of these multilaterals are included prior to the description of individual country ocean policies.

To complete the review of the NEMO policy, the strategic priorities were discussed in relation to National objectives defined in the Constitution, the National Environmental Management Act and related subordinate Acts.

3.3. Key Concepts in the South African White Paper on the National Environmental Management of the Ocean (NEMO)

The South African White Paper on the National Environmental Management of the Ocean (NEMO, 2014) is comprised of distinct sections that initially describe the national ocean environment; the ecosystems services this provides, the environmental governance mandate and thereafter describes the governance approach in terms of Strategic Principles and Objectives. The penultimate section of the Policy is a detailed illustration of the Ocean Governance Strategy that is discussed within four Strategic Themes where priority actions and issues are illustrated as Strategic Priorities and Priority Statements. This structure is an advance in detail over the Green Paper (NEMO, 2012) where only ocean management policy objectives and policy statements are identified. The Policy Objectives of the Green Paper and the Strategic Themes of the White Paper are consistent with each other.

The conclusion of the NEMO White Paper suggests using existing cooperative government arrangements to institutionalize the coordination that will be required to integrate ocean management across the government sectors. The White Paper concludes that the move to integrated planning must begin with an intermediate phase of coordinated sectoral management, which will be an advance over the current independent management of the various sectors through their respective national government departments. The White Paper (NEMO, 2014) describes the following Principles and Objectives (Ibid., 10):

3.3.1. NEMO Guiding Principles

i. The sustainable use and management of ocean resources and ecosystem services in order to benefit present and future generations.
ii. The protection of biodiversity in the ocean environment and the conservation of marine ecosystems.
iii. The application of the precautionary approach to sustainable use and conservation.

iv. The prevention, avoidance and mitigation of pollution and adherence to the polluter pays principle.

v. The strengthening of human capacity to deal with a changing environment, including the impacts of climate change such as increases in sea-surface temperature, sea-level rise and ocean acidification.

vi. The identification of economic opportunities which contribute to the development needs of the poor and vulnerable within the population ensuring human dignity.

vii. The promotion of collaboration and cooperative governance.

viii. The promotion of an ecosystem and earth system approach to ocean management.

3.3.2. NEMO Strategic Objectives

i. Coordinating and supporting the implementation of the relevant existing statutory and institutional frameworks.

ii. Establishing mechanisms for intersectoral data collection and sharing.

iii. Creating and maintaining a shared national knowledge base on the human use, status and functioning of the ocean.

iv. Establishing integrated ocean sustainable development and conservation ocean plans by the undertaking of strategic environmental impact assessments and the use of spatial planning tools.

v. Enhancing national human and technical capacity to better understand and utilize ocean resources and opportunities.

vi. Pursuing regional and international cooperation and governance mechanisms.

3.4. International Trends in Objectives and Priorities for Ocean Governance

3.4.1. Global Ocean Governance Concepts

Globally, there is a very definite emergence of the role of the global ocean as a critical and fully integrated driver of the planet's life support systems (Griffies, 2004; Harrould-Kolieb & Herr, 2012; Rodgers et al., 2015). This is illustrated in the many calls to understand this role through improved research and observations in global agendas such as United Nations (UN) multi-lateral agreements including the Conference of Parties on the UN Convention on Biological Diversity (CBD) and the Framework Convention on Climate Change (UNFCCC) (Pörtner et al., 2019). Global agendas have seen an expansion in the range of identified threats; while threats historically were centred around fishing and forms of habitat destruction; emerging threats now include: plastics, noise, climate change and ocean acidification, together with the potential dangers of geo-engineering such as ocean fertilization. These are articulated in the most recent global agendas described in the following sections.

3.4.1.1. United Nations Conference on Environmental Development

The Green Paper (NEMO, 2012) presents a relatively detailed overview of the major international conventions and treaties. It included tracking concepts that began with the Stockholm - United Nations Conference on Human Environment of 1972 that are reflected in landmark global treaties such as UNCLOS (UNCLOS, 1982) and the United Nations Convention on Biological Diversity (CBD, 1992). Key amongst the setting of global agendas is the United Nations Conference on Environmental Development (UNCED), first held in 1992 and every 10 years since. This first Conference which was held in Rio de Janeiro – Brazil, resulted in the common naming of this declaration as the Rio Declaration or Agenda 21 (UNCED, 1992). The 2002 Conference, now known as the United Nations Conference on Sustainable Development (UNCSD), was held in South Africa and produced the Plan of Implementation of the World Summit on Sustainable Development (WSSD, 2002), with the 2012 UNCSD being held in Rio de Janeiro again, producing the

Rio+20 Declaration titled the "The Future We Want" which was adopted by the United Nations General Assembly in July 2012 (UNCSD, 2012).

Agenda 21 called for responsible, equitable and sustainable development and greater levels of cooperation across nations for the protection of the Earth's environment. Chapter 17 of Agenda 21 focused on protection of the oceans, enclosed seas and coastal areas. This chapter recognized that the oceans formed an integrated component of the planet and encouraged states to understand the role of the ocean in climate change issues such as the ocean as a carbon sink, and how climate change will impact the ocean. Sustainability remained a strong theme, in areas inside and outside national jurisdiction.

The UNCSD 2012 or Rio+20 Conference included the ocean as a specific discussion in its outcome. This acknowledged that the "oceans, seas and coastal areas form an essential component of the Earth's ecosystem and are critical to sustaining it" (Ibid., paragraph 158). This builds on the idea of the planet as a single functioning system and the ocean is a significant role-player in the regulating and support services within this system. Concepts stressed included sustainable development; the role of marine ecosystem use in poverty eradication; sustainable livelihoods; food security; economic growth and the ecosystem and precautionary approaches to management. Conservation; sustainable use, economic growth; and intergeneration sustainability considerations for areas within and outside national jurisdiction are discussed. Threats to marine ecosystems identified in this declaration include: pollution (plastic, persistent organic pollutants; heavy metal and nitrogen-based compounds, marine debris); alien invasive species; sea level rise and coastal erosion; ocean acidification; fishing, fishing subsidies and illegal and unreported and unregulated fishing. The potential danger of ocean fertilization is noted and parties are requested to address this with "utmost caution" (Ibid., paragraph 167). Research and monitoring of the ocean for better management is proposed, especially in building resilience of marine ecosystems and the communities that depend on them with regards to ocean acidification. The area-based approach to conservation, and the use of coordinated and well-connected systems of marine protected areas highlighted in the 2002 Summit are also reaffirmed. The concept of marine spatial planning, while an emerging concept in national ocean policies, is not overtly discussed in the Rio+20 Outcome; while the United Nations Convention on Biological Diversity Target of 10% percent protection of marine habitats by 2020 is noted.

3.4.1.2. Convention on Biological Biodiversity

The Convention on Biological Biodiversity (CDB) which is the primary UN Biodiversity forum focusing on Biodiversity has evolved over its meeting of Parties every two years, since its first meeting in the Bahamas in 1994. The most recent negotiation of the targets for parties to the Convention took place in Aichi, Tokyo in 2010, and produced the Aichi Biodiversity Targets. This meeting also produced the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization, although implementation of these is still being discussed at subsequent CBD meetings, as is evidenced in the meeting outcome documents of 2014 and 2016. The set of 20 Aichi Targets were ordered into the following 5 Strategic Goals (CBD, 2010):

- Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society
- Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use
- Strategic Goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity
- Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services
- Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building.

Of the 20 Aichi Targets; Targets 6, 10 and 11 are specifically directed at marine biodiversity, with 6 and 10 falling within Strategic Goal B and Target 11 falling within Strategic Goal C.

Target 6 is aimed at intervening in the impact of fisheries and states that:

> By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem-based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.

Target 10 seeks to address the growing threat of climate change and ocean acidification:

> By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.

Target 11 sets percentage targets for protected areas and continues the concept raised at the Johannesburg World Summit on Sustainable Development (WSSD, 2002) around a network of marine protected areas:

> By 2020, at least 17 per cent of terrestrial and inland waters, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures and integrated into the wider landscapes and seascapes.

Beyond the Aichi targets the CBD Conference of Parties (COP) in the 2012 and 2014 meetings highlighted the need for national and international management interventions around marine ecological and biological significant areas (EBSAs). The CBD secretariat set in motion a series of specialist studies that identified these special areas in all ocean regions. Reports identifying these were tabled and noted at recent CBD COP meetings, which included areas adjacent to the South Africa on the East and West coast of the continent. The CBD in recent times functions towards progressing to Vision 2050 which states: “By 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people.”(CBD, 2018).

3.4.1.3. Sustainable Development Goals - SDGs

Besides the regular meetings of the Convention for Biological Diversity (CBD), the Sustainable Development Goals (SDGs) represent the most recent United Nations coordinated agenda on sustainable development. This agenda was agreed upon in 2015 at the General Assembly of the United Nations (UN General Assembly, 2015).

The 17 Sustainable Development Goals produced in 2015 and coordinated by the United Nations Development Programme, seeks to improve upon the Millennium Development Goals of 2000 through including a broader range of issues. The Millennium Development Goals were largely unmet. The SDGs include specific marine targets within Goal 14: Life Below Water – Conservation and Sustainable use the oceans, sea and marine resources. Most of the targets within this and other Goals have a time horizon within the 2030 period. Although the goals are ordered into 17 topics, the agenda description calls for work on the goals to be integrated. This will be of particular importance in the ocean ecosystems where there are multiple active sectors and where the ecosystem approach is established.

Within Goal 14, the target dates are spread across 2020, 2025 and 2030. Much of the agendas of the recent UNCSD meetings are echoed in these targets, which include encouraging interventions around: marine pollution; sustainable management (protection, strengthening resilience, restoration); impacts of fishing (overfishing, illegal, unreported and unregulated fishing, subsidies); conservation; economic growth from marine resources and inclusion of small-scale fisher opportunities; building of the scientific knowledge base and technology transfer and conservation and sustainable development through international law implementation as envisaged in UNCLOS. In measuring progress towards these Goals, there is a challenge around Goal 14 in gathering data and assessing progress on these against baseline information. Baseline information is not always present and it is largely expected that with 5 of the 10 targets within Goal 14 maturing in 2020, most of the targets, except for the conservation of at least 10% coastal and marine habitats, will not be met (Neumann & Unger, 2019).

3.4.2. Review of National Ocean Policies

Countries selected for this analyses will include those identified in the ocean management Green Paper (NEMO, 2012). The Green Paper did not offer criteria for the selection of national policies it reviewed. These included Australia; Brazil; Canada; China; Columbia; India; Japan; Norway; Portugal; Russia and the United States of America. The intention of the review is twofold: to determine if an independent review of the ocean policies identified in the NEMO Green Paper could identify similar common objectives and intentions and to determine the extent to which the objectives in of the Green Paper were translated into the White Paper. Later in Chapters Six and Seven this discussion is extended to the Marine Spatial Planning Act which was promulgated during the course of this study. The discussion component of this Chapter will reference more developing country Ocean Policies, as the list selected in the Green Paper is weighted towards developed nations.

The review of other country national ocean polices is an essential first step towards mapping the strategic direction of ocean policies and their objectives. This is important to measure if South Africa's Ocean Policy reflects these normative international trends and to what extent it is different from these international trends.

3.4.2.1. National Ocean Policy of Australia

Australia developed its oceans policy in 1998. The policy was conceptualized as a framework for integrated ecosystem-based planning and management for all of Australia's marine jurisdictions. Australia is similar to South Africa in that it also exercises maritime jurisdiction over sub-Antarctic territories as well as its continental jurisdictions. Australia's oceans policy is aimed at the ocean space falling outside the 3-nautical mile zone. The policy proposes Regional Marine Plans based on Large Marine Ecosystems (LMEs). The formulation of the plans and their implementation is managed by the National Oceans Ministerial Board, which is chaired by the Minister for the Environment and Heritage. The Board is guided by a National Oceans Advisory Group, which includes industry, community and government stakeholders. Each marine region has a Regional Marine Plan Steering Committee including regional stakeholders. The secretariat and technical support is provided by a National Oceans Office, which is located in Environment Australia (Intergovernmental Oceanographic Commission, 2007b).

The Australian policy recognises that oceans ecosystem in parts of the world have been degraded, and seeks to protect its relatively healthy marine habitats, including rehabilitation where required. As the policy states: "Management of our oceans purely on an industry-by-industry basis will not be sustainable in the long run. Activities such as fishing, tourism, shipping, aquaculture, coastal development and petroleum production must be collectively managed to be compatible with each other and with the ecological health of the oceans" (Ibid., 5). Regional Marine Planning allows the State to integrate sector interests and include conservation requirements. The oceans policy was formulated in order to:

i. ensure continuing marine ecosystem health
ii. safeguard marine biological diversity
iii. promote diverse, strong and sustainable marine industries
iv. provide increased certainty and long-term security for all marine users and
v. ensure the establishment of a representative system of marine protected areas (Ibid., 12).

The policy was based on a set of principles which include ecosystems planning, generational values, sustainable development and internationally competitive economic use, scientific knowledge of the ocean environment and the precautionary principle. The policy notes that the development of regional marine plans must be based on science and will require time and investment. The planning will include science based sustainability indicators and monitoring mechanisms. The policy recognizes that the large marine jurisdiction will require a surveillance and enforcement programme and resourcing. This may include civil patrols in sub-Antarctic waters.

Possible marine regional planning areas have been identified through use of the Interim Marine and Coastal Regionalization for Australia ("IMCRA"). This classification system describes areas from 3000 to 240 000 km2. This initial classification forms the basis for further ecologically planning.

3.4.2.2. National Ocean Policy of Brazil

Brazil adopted its national maritime policy in 1994. The policy is directs development of living and non-loving ocean economic sectors. Resource utilization includes territorial waters, the EEZ and the continental shelf and sustainable social and economic development (Intergovernmental Oceanographic Commission, 2007e). The development specifically seeks income, job creation and social inclusion.

Principles include the harmonization, furthering national interests, precautionary principle, sustainable development and biodiversity (include genetic) protection. Like Australia, emphasis is placed on improving marine research to inform decision-making. Brazil has overtly considered research into the exploitation of minerals and resources in The Area (i.e. in the ocean outside of its maritime jurisdiction in the High Seas).

Unlike Australia, the ocean policy is comprised of multi-year sectoral plans, which are drawn up under an umbrella framework. This planning occurs under the coordination of the Inter-Ministerial Commission for Marine Resources ("CRIM").

3.4.2.3. National Ocean Policy of Canada

The Canadian Ocean Policy was set in place in 2002 and describes its purpose as ensuring healthy, safe and prosperous oceans for the benefit of current and future generations. The Canadian policy direction is contained in its Oceans Act. The Act nominates the Minister of Fisheries and Oceans as lead in the development and implementation of the national ocean management strategy. The strategy like other country strategies seeks an integrated and coordinated approach to ocean management through an ecosystem approach (Intergovernmental Oceanographic Commission, 2007c). The strategy identifies three specific operational areas: institutional governance mechanisms; integrated management planning and promoting stewardship and public awareness. Integrated management plans aim to balance conservation and protection with economic activities. Coordinated governance is sought across several active government institutions and policies.

The three high level objectives of the policy are: Understanding and protecting the marine environment; Supporting sustainable economic opportunities; and International leadership. The policy acknowledges Canada's international role in ocean governance.

The policy notes the existing and potential sectors including fisheries; energy; minerals; shipping and ecotourism. The policy articulates the importance of a science and knowledge foundation to set management objectives, performance indicators and the assessment of ecosystem health.

As a maritime nation, Canada is in full agreement with the objectives set out in Chapter 17 of Agenda 21. As the strategy states "Chapter 17 of Agenda 21 is specifically devoted to oceans, and outlines principles and objectives for oceans management. The Oceans Act and Canada's Oceans Strategy represent a concerted effort to implement the Agenda 21 principles of sustainability, integrated management, and precaution" (Ibid., 67).

3.4.2.4. National Ocean Policy of China

The national ocean policy of China was concluded in 1998 (Intergovernmental Oceanographic Commission, 2007i) and describes its purpose as demonstrating its marine capabilities, protect its sovereign interests and sustainable use of existing and emerging resources. Keys concepts in the Policy are highlighted as:

i. Rationally utilizing marine resources and promoting the coordinated development of marine industries
ii. Reinforcing oceanographic technology research and development
iii. Overall planning for marine development and control
iv. Safeguarding the new international marine order and the state's rights and interests
v. Setting up a comprehensive marine management system
vi. Actively participating in international cooperation in the field of marine development.

China has established an administrative system for marine environmental protection which places areas of responsibility within the various States. These include environmental protection departments for conservation roles; marine administration agencies for the monitoring and scientific research; harbour administrations for pollution by ships into harbour waters; and fishing port administrations for fisheries monitoring and pollution management.

China's research and technology development programmes are aimed at advances in marine monitoring, deep-sea exploration; marine resources assessment and use across a range of resources including marine energy; desalination; aquaculture, marine pharmaceuticals.

China is developing a legal framework for the comprehensive and coordinated management of its marine areas with some 3 663 marine zones divided into different various use, development and conservation areas.

3.4.2.5. National Ocean Policy of Colombia

The national ocean policy of Colombia was completed in 2007 to promote the sustainable development of ocean and coastal regions and its maritime interests

(Intergovernmental Oceanographic Commission, 2007d). Principles of the policy are: the consolidation of the territorial unity of the state; the interest of the state; sustainable development and inter-generational equity; the balancing of economic development; multi-sectoral and multi-disciplinary approach; and community participation.

Colombia's policy considerations include tourism, fishing, maritime transport, mining, alternative energy generation, biodiversity conservation and recovery, maritime culture and global climate change. Implementation of ocean governance resides with the Colombian Environment Ministry and includes development of long-term national programmes on marine biodiversity, surveys and control of marine pollution. Columbia promotes coordination and integration in sector management through the Columbian Ocean Commission ("CCO"). The Vice President manages the work of the CCO which includes government ministers, academia, industry and civil society representation. A National Maritime Authority has also been established to create a coastal master plan on protecting national integrity and intersectoral coordination.

Existing marine uses include transport, fishing and aquaculture, tourism, minerals, hydrocarbons and renewable energy. Columbia seeks to protect vulnerable habitats such as mangroves, coral reefs and beaches. Three large marine areas have been identified namely: Caribbean Oceanic and Continental Region; the Caribbean Island Region and the Pacific Region. Colombia aims to pursue sustainable use for national social, environmental and economic benefit.

3.4.2.6. National Ocean Policy of India

India Ocean Policy appears to have its origins in the 1982 Ocean Policy Statement (Ministry of Earth Sciences, 1982). While a more fully detailed Policy document like other countries have undertaken more recently cannot be found, this Statement has given rise to a body of exploratory and science-based work that has been housed in a variety of institutions, culminating in 2006 with the establishing of the Ministry of Earth Sciences (MoEs). This Ministry created and implemented detailed science and survey plans of the ocean and atmospheric jurisdictions of India. The ocean and coastal sectors realised a rapid growth in ocean science and technology disciplines to support a wide range of industrial and integrated management programmes. These included the National Institute of Ocean Technology (NIOT) and the Indian Centre for Coastal and Oceanographic Information Systems (INCOIS). The initial statement in 1982 emphasized the science aspects, and this was again reiterated in the Vision Perspective Plan of 2015 (Ministry of Earth Sciences, 2011) This later plan additionally called for the establishment of the an Ocean Commission. Together with the generation of the science support base, these policy documents motivated for centralized data and information management. India also has an allocation in the High Seas Area awarded through the Seabed Authority to explore and develop deep sea mining technologies.

3.4.2.7. National Ocean Policy of Japan

The national ocean policy of Japan was completed in 2007 (Government of Japan, 2007). It states its purpose as:

i. Clarifying role-player responsibilities with respect to the ocean
ii. formulation of an oceans plan
iii. establishment of a headquarters for oceans policy and
iv. promotion of the peaceful coexistence of humanity and the oceans.

The policy notes that a balance is required between exploitation and conservation of the marine environment. The Policy recognises UNCLOS and other international agreements. Policy development and implementation is led by the Headquarters for Oceans Policy which is established as a branch of cabinet and includes all ministers. The Director General of the Headquarters is the Prime Minister. Japan’s policy includes measures for cooperative governance. All implementation measures are costed and funded by central government.

The policy while seeking sustainable development has a particular focus on fishery resources, protecting habitat of ocean fauna and flora, regulating oil and gas exploration, and minerals including manganese and cobalt. Measures have been established to preserve biodiversity, reduce ship and land based pollution and control oil spills. The state undertakes scientific surveys towards enhancing understanding of the oceans and improving prediction of changes in marine ecosystems.

3.4.2.8. National Ocean Policy of Norway

The national ocean policy of Norway was completed in 2002 (Intergovernmental Oceanographic Commission, 2007h). The stated purpose being balancing the commercial interests connected with fisheries, aquaculture and the petroleum industry within a sustainable development framework.

The policy accepts the ecosystem-based management approach and includes managing cumulative impacts and considerations to fund pollution mitigation and clean-ups. Norway notes that the UN Expert Group on the Marine Environment has identified pollution from land-based sources, destruction of habitats, fisheries overexploitation and the introduction of non-indigenous species as the main threats to the marine environment in a global context.

The policy recognises the work of the CBD and endorses the Malawi Principles on the Ecosystem Approach (Malawi Principles, 1998), an annexure to the CBD, as the preferred method for implementing the ecosystem approach.

The policy plans regional sea management plans. Norway has constructed and published these as integrated regional sea plans, over the last decade. Coastal waters are defined as waters within one nautical mile from the shore, with the regional seas plans covering areas beyond this.

Science-based management is a requirement of the policy which states that research provides knowledge of and insight into the structure and functioning of marine ecosystems. Knowledge of ecosystems especially over long time series provides the bases for status reports, understanding trends, developing forecasts and establishing environmental quality goals and objectives.

There is increasing investment in surveying Norway's coral reefs. The focus is on the isolation of genetic resources with significant commercial potential. Spatial management will be used to establish a network of marine areas that will receive some protection, to protect the remaining coral reefs and other niche habitat such as seaweed forests.

3.4.2.9. National Ocean Policy of Portugal

The national ocean policy of Portugal was completed in 2006/7 (Intergovernmental Oceanographic Commission, 2007g). The policy promotes cooperative governance through establishing the Mission for the Affairs of the Sea, mandated to cover all maritime affairs. The strategy formulates its strategic pillars as the following goals: knowledge; spatial planning; and active promotion of national interests and objectives. High priority areas are noted as setting up an inter-ministerial coordinating commission and improved coordination nationally and across international forums. The policy identified eight strategic actions (objectives):

i. Raising societal awareness of the importance of the ocean
ii. The inclusion of ocean related matters into school curriculum
iii. The promotion of Portugal as a European Centre of excellence in ocean sciences
iv. Spatial planning of maritime activities
v. The protection and restoration of marine ecosystems
vi. The development of the maritime economy
vii. The promotion of new technology for maritime activities and
viii. The protection of maritime zones under national jurisdiction.

The strategy recognizes that sectoral management is ineffective and that development of a maritime economy is facilitated through clear and transparent governance and administration, including licensing. In addition to integration, the policy notes the need for the ecosystem approach and sustainability considerations.

Principles of policy are interconnectedness of the ocean; sustainable development; the precautionary principle; and the ecosystem approach. The policy also includes considerations of active defence and protection of national interests. Spatial planning is proposed for the identification and planning around new and future uses of the ocean. Integrated management is aimed at promoting the building of knowledge and mapping; simplifying administration; building criteria for decisions; conservation and restoration as required; sustainable developing through management of potential conflicts across sectors.

3.4.2.10. National Ocean Policy of Russia

The Marine Policy Document of the Russian Federation was available in 2001 after being approved by the President (Intergovernmental Oceanographic Commission, 2007f). Sovereignty is a key issue that is emphasized including preserving this using military and non-military means. The document recognizes international laws including UNCLOS. Integration around science based sustainable planning of economic use and management of the ocean are key concepts. Management objectives can be divided into short and long-term objectives. Short term objectives include geopolitics; national socio-economic considerations; marine resource use; scientific and technological advances and efficiencies in the maritime sector. Long term goals are planned for shipping; exploitation and conservation; improving scientific work and carrying out naval activities. The document identified goals for within Russian territory, the High Seas areas and, in other regional seas, where bi-lateral arrangements can be made with coastal states. Maritime objectives are described for the Atlantic; Arctic; Pacific; Caspian and Indian Oceans.

Key considerations of the strategy include:

i. Administration of the marine activity through federal institutions following the leadership of the Naval College

ii. Economic Provision through government investments in shipping, ports and science and technology
iii. Ensuring safety of marine activity for industries and citizens, as well as environmental protection and pollution management
iv. Staffing through emphasis on human capacity being developed through the various phases of schooling and educations and
v. Provision of information to support safety and resource exploitation and policy implementation. Uniform, centralized or coordinated and widely distributed systems are suggested as operating standards for information systems.

3.4.2.11. National Ocean Policy of the United States of America

The national ocean policy of the USA was completed in 2004 (Intergovernmental Oceanographic Commission, 2007a), and revised by an additional report from an Interagency Task Force on Ocean Policy in 2010 (USA - White House Council on Environmental Quality, 2010). The 2004 policy recommended moving towards an ecosystem-based management approach by focusing on three crosscutting themes:

i. A new coordinated national ocean policy framework to improve decision making
ii. Cutting edge ocean data and science translated into high quality information for managers and
iii. Lifelong ocean education to create well informed citizens with a strong stewardship ethic.

The policy called for the establishment of a National Oceans Council (NOC) located within the executive office of the President and composed of cabinet secretaries (ministers) and administrators of relevant independent agencies. The guiding principles for the policy are described as sustainability, stewardship, ocean-land-atmosphere connections (earth system), ecosystem-based management, multiple use management, preservation of marine biodiversity, best available science and information, adaptive management, understandable laws and clear decisions.

Emphasis is placed on investing in science and exploration with the lead project being the Integrated Ocean Observing System. In order to fund activities contemplated by the oceans policy, the creation of an Oceans Policy Trust Fund located within the USA Treasury was proposed. Revenues were to be generated from permitted activities in federal waters.

The implementation of the original USA ocean policy proved to be difficult. The coordination between spheres of government, independent agencies and business interests was particularly problematic. In an attempt to address these challenges an inter-agency task force was established in 2009 and released a final report in 2010. The report noted that no single agency could successfully resolve the complex and pressing problems facing the USA's maritime zone. The suggested governance structure was a reconstituted National Oceans Council (NOC), and stressed the need for inter-agency coordination. The new council comprised of role players from all the spheres of government. The 2010 final report re-emphasised the policy aims of the 2004 policy and further developed a strategy around nine priority objectives:

i. Ecosystem-Based Management
ii. Coastal and Marine Spatial Planning
iii. Informed Decisions and Improve Understanding
iv. Coordinate and Support
v. Resiliency and Adaptation to Climate Change and Ocean Acidification
vi. Regional Ecosystem Protection and Restoration
vii. Water Quality and Sustainable Practices on Land
viii. Changing Conditions in the Arctic
ix. Ocean, Coastal, and Great Lakes Observations, Mapping, and Infrastructure.

3.4.3. Summary of Ocean Management Strategies

The Oceans Policies reviewed have several shared concepts. The policies have generally been developed over the last two to three decades and aim to reaffirm or establish governance over the national ocean jurisdictions. The study, after reviewing the country policies identified in the NEMO Green Paper, has identified the extent to which the common concepts and trends were included in the Green and White Ocean Governance Policy Papers. The commonalities across the policies reviewed can be grouped in the following categories. These are discussed more fully in Sections 3.5 and 3.6 below.

There are several similarities among the objectives that these nations have identified in their ocean management policies. The South African Ocean Policy Green Paper (NEMO, 2012) identified trends at the levels of objectives and priorities. Common objectives of national ocean policies observed in the Green Paper are (Ibid., 45):

i. Improve the competitiveness and effectiveness of existing maritime activities taking place within their jurisdiction while at the same time researching and developing innovative and responsible future marine uses
ii. Maintain and improve marine ecosystems, conserve biodiversity and restore degraded habitat and
iii. Participate and strengthen their involvement in global and regional developments and efforts, which support efforts to combat climate change.

Common priorities of national policies observed in the Green Paper are (Ibid., 45):

i. Extract optimum economic advantage from marine resources
ii. Marine research and monitoring
iii. Protecting the marine environment and tackling climate change and
iv. Maritime spatial planning.

The study of the national ocean policies selected by the Green Paper confirmed these observations on ocean governance objectives and priorities. National policies are focused on improving the country's (social and economic) return from ocean ecosystems. Ocean polices want to achieve improved returns from the ocean in a sustainable manner, through enabling governance mechanisms. The polices then elaborate on methods for integrating ocean governance such as marine spatial planning (MSP).

3.4.3.1. Integrated Sectoral Management and Nomination of an Ocean Governance Authority

All of the ocean policies emphasize the need for integration and a cross-sectoral approach, as a result of the many sectors that use the ocean surface, water column and sea bottom. This concept is illustrated efficiently by the following extract "Integrated ocean management is not only the most appropriate framework for achieving long term goals for oceans and seas development, but also a necessary one to assure a proper sustainable development of the oceans and seas within the normative structure established by UNCLOS…Integrated management complements sectoral management particularly by providing decision-makers and regulators with access to information and advice required to develop sectoral measures which support ecosystem-based management" (Statement to the European Union, delivered by H.E. Mr. José Antonio Yturriaga Barberán, Ambassador at Large for the Law of the Sea, 11 April 2002). This sentiment largely reflects the move towards integration of ocean management and marine spatial planning that was growing in popularity at the time.

Integrated programmes require government departments to work towards inter-department programmes. Early nomination of a coordinating agency or authority appears to be a key initial step. This is an important step as often government departments and ministers work on a peer or colleague basis, and a concerted effort is required to develop and implement cross department programmes. A champion to drive inter-departmental business and operational processes is required. One option is to raise these cross sector programmes to the office of the head or deputy head of state, which some countries have chosen to do for ocean governance, such as the Columbia, Japan and the USA.

3.4.3.2. Decision Making Processes and Marine Spatial Planning

The decisions making process is key; as with all cross sectoral work, a suitable authority to make decisions must be identified and formally appointed. This decision making entity will approve interventions such as development plans, restricted areas or marine spatial plans. Such an MSP decision making authority has had various models in the policies reviewed but a common theme is that the authority must be established clearly and fairly early on. The MSP decision making authority is different from the champion department described above. The administrative champion may be included in the decision making authority. The generic steps in MSP are defined and illustrated in several handbooks on developing such plans, see Figure 4 below (Schultz-Zehden et al., 2008; Ehler & Douvre, 2009).

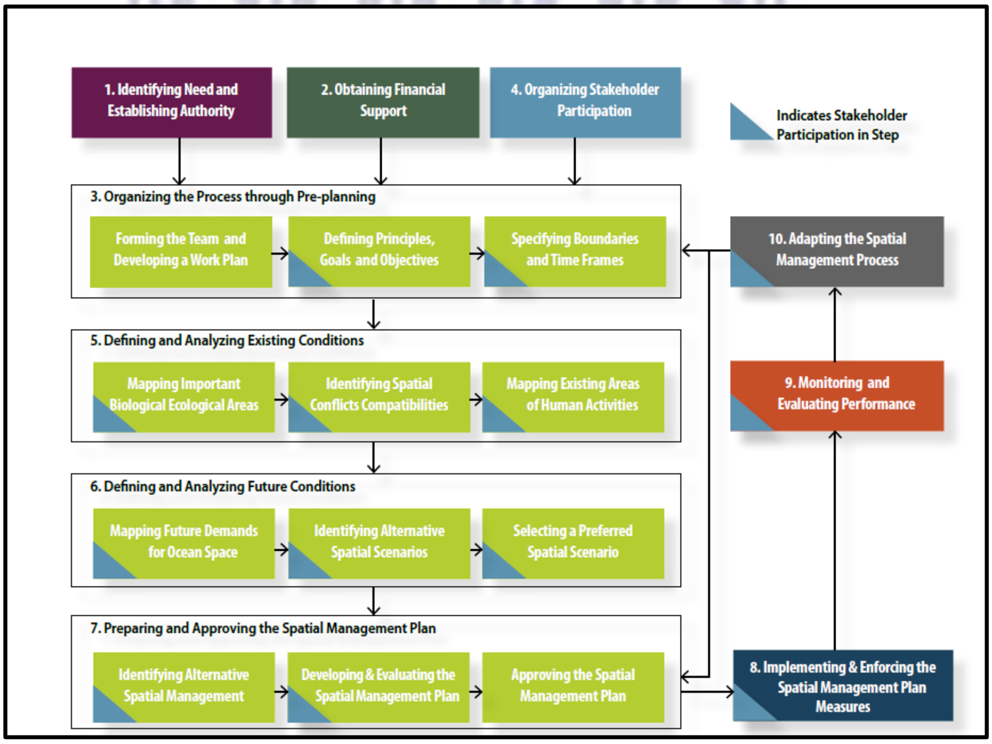

Figure 4. Process map for MSP (Schultz-Zehden et al., 2008)

The South African MSP process is described in the MSP Framework and Act (Marine Spatial Planning Framework, 2017; MSPA, 2019). These establish processes towards developing and approving area plans. The South African processes follow the guideline above to some extent, but does not describe funding arrangements or specifics on multiple entry points for stakeholder engagements.

3.4.3.3. Ocean Data Collection and Building a Knowledge Base for National Priorities

Countries have profiled the collection and management of data towards improved management and resource use. Primarily countries developed ocean polices in the national interest towards increasing the use of ocean resources. Several countries acknowledged in their national polices that the ocean resources are not optimally used and that their ocean policies are intended to optimise existing as well as increase the harvesting or use of new resources. To achieve this countries advocated for more science investment as an access mechanism to improving resource use. Scientific surveys were promoted to map the location and quantity of living and non-living resources, as well document biodiversity and habitats that require protection status. Technology advancements were required to optimise existing uses as well as promote a diverse range of new uses. Aligned to this were data management systems and information sharing systems.

3.4.3.4. Ecosystem and resource sustainability

National Ocean Policies were unanimous that marine resource utilization must take place sustainably with due regard to maintaining the health of ocean ecosystems. Included in their objectives of sustainable use were the mitigation and management of pollution impact on ocean ecosystems. Some policies linked ecosystem functioning to earth system considerations like climate change.

3.4.3.5. Regional and International Cooperation and Influence

More developed countries, and countries with histories of distant water fishing and colonisation have included recognising the political influence potential in the use of ocean territories. Operations in and management of the mainland and distant ocean territories can be used to access resources and extend political and ideological influence.

3.4.3.6. Education and Citizen Awareness Programmes

Countries recognised that generally citizens and industrial sectors may not always have had an association with the ocean. Even where these relationships have existed, they generally are narrowly focused. Fishing being the best example of this where fishers follow traditions intergenerationally. There is a need for citizen education and awareness towards building a relationship with the ocean ecosystems and the wider range of marine resources and applications. Improved stewardship is also promoted through education and awareness programmes.

3.4.3.7. Underrepresented Concepts in the South African Ocean Policy

Four areas of emphasis in the oceans polices reviewed are considered in the study to be inadequately articulated in the South African White Paper (NEMO, 2014). While other countries articulated strong and empowered coordinating units or agencies to operationalize marine spatial planning, the South African White Paper only stipulates the current mechanisms of government will be used and no new unit or agency will be formulated.

Data knowledge and shared platforms received much attention in the reviewed national ocean policies as a critical initial step in coordinated planning. This notion of an Ocean Atlas and Information System is raised in the White Paper but the operational mechanism and lead agency is not stipulated.

Similarly harmful anthropogenic impacts are considered to be insufficiently addressed by the White Paper as only some pollution aspects are selected for improved management. Direction on responsible agencies or time frames or a prioritization of pollution categories are not offered by the Policy. Also, the reasons for only some aspects of pollution being highlighted in the White Paper is not explained. The White Paper does however stipulate that government will identify norms and standards and indicators and thresholds for the various ocean industry sectors. Aspects of pollution that could have been incorporated with the identification of suitable lead government agencies are water quality (estuarine, nearshore and offshore) with candidate lead and partner agencies being the Department of Environment, Forestry and Fisheries and the Department of Water and Sanitation at the national level, with specified roles for provincial and local government agencies for estuaries and nearshore areas. Targets for the maintenance of water quality at existing standards or for the zero tolerance of particularly harmful pollutants could have also being specified here, such as not compromising the receiving water standards to point of sustained deleterious impacts on the biodiversity assemblage in vulnerable habitats.

Citizen awareness and education is the concept that, while very prevalent in the reviewed ocean policies, is not detected in the South African White Paper. It is also not included in the list of trends identified in the Green Paper review of other country policies. The reasons for this is unclear, however this does represent a departure from the typical marine spatial planning guide that makes allowances for stakeholder engagements and consultation at several points in the process, see Figure 4 above.

3.5. How does the South African Ocean Governance Policy Reflect International Trends?

The preceding review of the national ocean policies and the international forums allow for a determination of the common denominator themes that have emerged over the last few decades on oceans and coasts governance.

Four recurring principles in Ocean Governance, drawn from international instruments over the last few decades have been described in the South African Ocean Policy Green Paper (NEMO, 2012).

The NEMO White Paper (NEMO, 2014) articulates these national and international trends to various degrees in the Strategic Themes. The White Paper then further defines each of the four Strategic Themes into Strategic Priorities and then into Priority Statements. The Strategic Themes of the White Paper are:

i. Ocean Environmental Information

ii. Ocean Environmental Knowledge for Sustainable Development
iii. Ocean Environmental Management and
iv. Ocean Environmental Integrity.

Table 1 matches each of the Strategic Themes and Priority Statements of the White Paper to the common objectives; priorities and principles identified in the review of the various national ocean polices from other countries and the international conventions and forums. Columns 1 to 11 describes the common objectives, priorities and principles as they are published in the South African Ocean Governance Green Paper. Columns 12 to 15 describe common concepts that this review has identified that are either not described in the Green Paper or not emphasised to the extent that they are reflected in other National Policies (see section 3.4.3.7 above). The Additional Common Concepts are included to measure and assess how (if at all) the various Priority Statements of the White Paper can be interpreted as responding to these. Figure 5 aims to show if and how the White Paper reflected the global themes, trends and agendas in ocean governance. (Note: The full description and scoring allocated to the NEMO White Paper effectiveness in reflecting national and international trends in provided in Table 17, included as Appendix 1. The international trends identified in Table 17 are derived from both the review of international multilateral agreements in Section 3.4.1 and the other country national ocean policies in Section 3.4.2.)

Table 1. NEMO Policy Strategic Priorities' Reflection of International Trends in Ocean Governance

International Trends	Objectives 1	Objectives 2	Objectives 3	Priorities 4	Priorities 5	Priorities 6	Priorities 7	International Principles 8	International Principles 9	International Principles 10	International Principles 11	Additional Common Concepts 12	Additional Common Concepts 13	Additional Common Concepts 14	Additional Common Concepts 15
	Maintain and improve marine ecosystems, conserve biodiversity and restore degraded habitat	Improve the competitiveness and effectiveness of activities existing within their marine jurisdiction while at the same time researching and developing innovative and responsible future uses	Participate and strengthen their involvement in global and regional developments, which support efforts to combat climate change	Support marine research and science	Protect the marine environment and tackle climate change	Extract optimum economic advantage from marine resources	Implement marine spatial planning and the ecosystem approach	Principle of intergenerational equity which holds that natural resources must be preserved for the benefit of future generations	Principle of sustainable use which holds that natural resources should only be exploited (utilized) in a sustainable, prudent or rational or wise or appropriate manner	Principle of equitable use or intra-generational equity which holds that the exploitation of natural resources must be undertaken in an equitable manner	Integration principle, which holds that environmental considerations should be, integrated into economic and other development plans, programmes and projects as well as that development needs should be taken into consideration when environmental objectives are applied	Institutional Arrangements for MSP	Data and knowledge shared platforms	Addressing anthropogenic threats	Awareness, training and capacity building
*NEMO Reflection - Total from Table 17	9	3	8	9	3	4	7	9	2	6	6	1	4	7	2

*The NEMO Reflection Total in the last row is the number of Priority Statements that reflect each of the Objectives; Priorities; International Principles and Additional Common Concepts

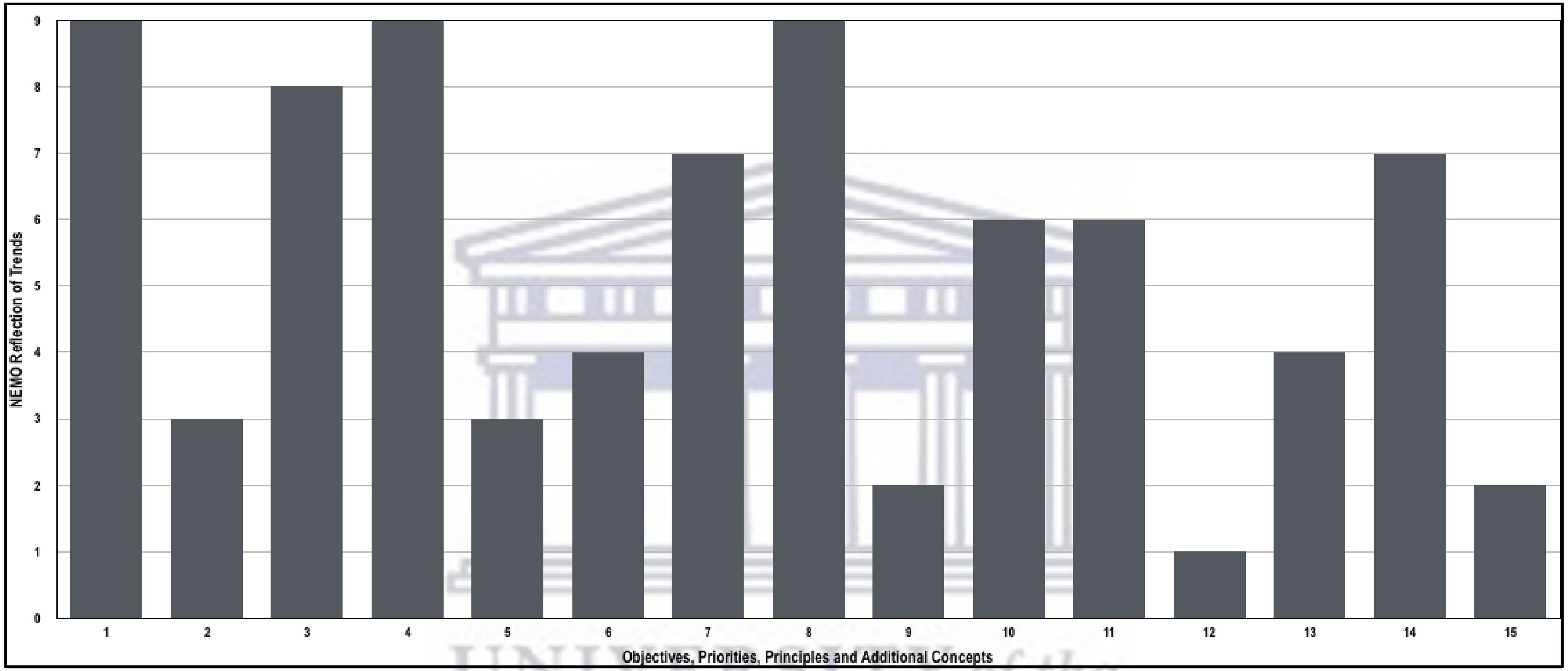

Figure 5. Scoring of NEMO Priority Statements Reflection of International Ocean Governance Trends (The bars in the graph correspond to the International Trend of the corresponding column in Table 1.)

Figure 5 shows that all of the identified objectives, priorities, principles and concepts from other National Policies and Global Agreements are reflected in the NEMO policy (NEMO, 2014). These are reflected to varying degrees of emphasis with some concepts being reflected across several Priority Statements while others being reflected limitedly. Note the NEMO Reflection scores at the bottom of Table 1 are totals from Table 17 attached as Appendix 1.

The Priority Statements of NEMO appear to heavily reflect the conservation and protection aspects of Ocean Governance in their wording, see Columns 1,3,4,5,7,8,10,11 and 14 in Table 1 and Figure 5. Economic and social aspects are reflected to a lesser extent, see Columns 2, 9 and 11 in Fig 3.1. Regarding the additional Concepts identified in this review; Institutional Arrangements for Marine Spatial Planning (MSP) which was observed in all of the National Policies is reflected only once in the NEMO strategic statements and is not defined in detail except to say that existing South African Government Cluster Arrangements will be used, see Column 12. Notably when the NEMO White Paper was drafted as a Bill (Marine Spatial Planning Bill, 2017), it focused only on the MSP process and institutional arrangements. This focus on MSP continued into the Act (MSPA, 2019).

The concept of shared data and information platforms (Table 1, Column 13) for MSP is described in the Policy Objectives and Policy Statements of the Green Paper (NEMO, 2012) and additionally in the Priority Statements of the White Paper (NEMO, 2014). It is highlighted in this study as additional item that can be emphasised because other country national polices emphasise data platforms as a critical requirement and necessary tool for MSP. Such an information sharing tool can be used as a common marine spatial planning platform across sectors, so that all sectors will be using the same primary information on use scenarios, avoiding incorrect assumptions that can later jeopardise the MSP process. Although sharing data and data products are associated with four of the White Paper Priority Statements; it is specifically referenced as a shared Atlas once and this lies within Strategic Priority 2. Ocean data management and shared data platforms are perceived, in this study, as being equally important as institutional and mandated structures responsible for MSP.

Similarly, although addressing anthropogenic threats to ocean ecosystems is described in the Priority Statements of the White Paper, it is established as a category in this study to assess how the White Paper responds to this international governance theme or trend. Mitigation and management of pollution impact is echoed strongly in other country national policies and is dealt with in several (seven) of the priority statements of the White Paper (Table 1, Column 14). Priority Statement 3.2.2 of the NEMO White Paper also makes provision for new areas of ocean use that are not yet contemplated in the South African legislation such as ocean geo-engineering. The NEMO policy therefore adequately incorporates the anthropogenic pollution impact threats to the ocean environment in terms of an identified policy area. It does not however provide details on policy targets or aspirations such as limiting certain sources or categories of pollution.

Awareness Training and Capacity Building is dealt with only twice in the Priority Statements of the White Paper (see Table 1, Colum 15). Awareness Training and Capacity Building in general is not dealt with in any detail in the South African White Paper with only references in Strategic Priority 1.2 and 2.3, which relates to increasing the number of science graduates available to the ocean sectors, and making maps available to facilitate the identification of economic opportunities. This trend in communication and awareness raising on the role of the oceans in the earth system and on its developmental potential is observed in other country national policies. This awareness raising is articulated for industrial sectors, government agencies and the general public as well.

Unlike the Institutional Arrangements concept, which is only dealt with once in the White Paper but then very much elaborated in the Draft Bill and MSP Act, the Awareness, Training and Capacity Building concept does not enjoy further elaboration and remains an area that is under-represented in the NEMO policy and

Marine Spatial Planning Act (NEMO, 2014; Marine Spatial Planning Bill, 2017; MSPA, 2019).

3.6. South African National Government Priorities

On the assessment of the NEMO White Paper and whether it responds to the National Agenda, the conclusion must be drawn that the White Paper does address the Constitutional Imperative of Section 24 of a safe environment that has benefits to society. While the NEMO policy can then be considered to respond to the Constitution, interrogation as to whether it responds to the current Government priorities, will have to be considered separately. The 2015-2019 South African Government administration has defined its role as focusing on the triple challenges of poverty, inequality and unemployment. This was articulated in the 2015 State of the Nation Address by the previous President of the Republic where he announced the Nine Point Plan to stimulate the economy (Zuma, 2015). Point Nine of this plan specifically addressed the Oceans Economy. The Nine-Point Plan serves as a response to the slow economic growth of South Africa by transforming the economy and increasing investments and included the following:

1. Resolving the energy challenge
2. Revitalising agriculture and the agro-processing value chain
3. Advancing beneficiation or adding value to our mineral wealth
4. More effective implementation of a higher impact Industrial Policy Action Plan
5. Encouraging private sector investment
6. Moderating workplace conflict
7. Unlocking the potential of SMMEs, cooperatives, township and rural enterprises
8. State reform and boosting the role of state-owned companies, ICT infrastructure or broadband roll out, water, sanitation and transport infrastructure
9. Operation Phakisa aimed growing the ocean economy and other sectors.

The National Development Plan – Vision for 2030 (NDP) was developed in 2011 and led by Minister in the Presidency, is aimed at eliminating poverty and reducing inequality by 2030. This National strategy also emphasised the building of safe communities and job opportunities. The Plan comprises thirteen chapters, includes a set of objectives and actions for each chapter and describes the strategies and actions that will serve the development of the national economy (National Planning Commission, 2012).

The chapter headings of the NDP are:

1. Economy and employment
2. Economy infrastructure
3. Environmental sustainability
4. An integrated and inclusive rural economy
5. Positioning South Africa in the world
6. Transforming human settlement
7. Improving education, training and innovation
8. Promoting health
9. Social protection
10. Building safer communities
11. Building a capable and development state
12. Fighting corruption
13. Transforming society and uniting the country.

The above two sets of Government objectives: the Nine Point Plan and the NDP, provide recent insights into Government agendas. In alignment to these, the White Paper aims to facilitate the stimulation of the Ocean Economy. The Ocean Economy was also included as work in progress in the newly appointed President's Speech at the opening of parliament – State of the Nation Address in 2018 (Ramaphosa, 2018). President Ramaphosa's State of the Nation Address at the beginning of 2020 did not mention the Oceans Economy specifically but did include a commitment to continue with the expansion of the Port of Durban – South Africa busiest container terminal port (Ramaphosa, 2020). The Speech also committed South Africa to a low carbon economy, which may have implications for the expansion of coastal wind generation.

The National Development Plan does not specifically address the ocean as an economic sector. References to the ocean are included in the environmental objectives and also with regards to being important for trade. Ocean governance or a national ocean strategy does not enjoy attention beyond these areas in the NDP.

The Operation Phakisa: Developing the Oceans Economy Programme is intended to contribute to the economic development of the country both in terms of jobs and domestic product. With South Africa's official unemployment reaching 30% (Statistics South Africa, 2020), there will have to be optimisation of employment opportunities in existing major areas such as mining and agriculture, and also the creation of new opportunities such as those offered by the oceans economy. The ocean economy represents a new sector for training, employment and domestic product. Towards this end, the Ocean Policy which proposes sustainable development of the ocean and provides a tool in the form of MSP, does not overtly hinder the economic objectives of the NDP. It does not however overtly support an aggressive expansion of the ocean economy either. The recent speeches by the President, the NDP and Operation Phakisa gives the impression that South Africa must be urgently growing its economy. This is not the tone of the White Paper which promotes a steady, rational approach towards responsible ocean use, with emphasis on ecosystem-based management towards maintaining the integrity of ocean ecosystems.

3.7. How does the South African Ocean Governance Policy Reflect National Government Priorities?

The Green Paper, White Paper and Marine Spatial Planning Act can be viewed as the policy development cycle of Ocean Governance in South Africa. The Green Paper appears to be drawn from best or normative practice elicited from reviews of other country national ocean policies and from global multi-lateral agreements. The White Paper carries these to varying degrees into its drafting with notable exceptions of citizen awareness and education programmes and the recent trends in blue carbon discussions. While there is general agreement between the Green and White Papers, the MSP Act signifies quite a departure from the many performance areas of the White Paper and focuses only on defining a process and structure for marine spatial planning.

The environmental, biodiversity, ecosystem, species and pollution management intentions are all excluded from the MSP Act, with only a general sustainability provision made as a Principle for consideration during the creation of spatial plans. There is then the question of what will the policy basis be for the excluded intentions of the White Paper. Options can include creating a separate Oceans Act as contemplated in the Green Paper or adding a Chapter on Ocean Management to the Integrated Coastal Management Act. The Integrated Coastal Management Act can be seen as an Act heavily weighted on regulating human behaviour in the coastal areas and this can then be extended to the deeper ocean for the concepts highlighted in the White Paper such carbon capture and storage; deep sea exploration; ocean fertilization; alien invasive species; sewage, chemical and industrial effluent. In doing this, there will have to be an assessment and possible inclusion of other emerging issues not contemplated in the White Paper such as noise, plastic pollution and blue carbon-earth system considerations. There is some precedent for the revision of existing environmental Acts as the Protected Areas Act was amended post the 2010 reorganisation of National Departments to include provision for Marine Protected Areas (NEMPAA Amendment Act, 2014).

Reasons for the excising of the MSP component of the White Paper and its selection for the MSP Act are not offered by the Department of Environmental Affairs. The timeline of the progression of the formulation of the Green Paper, White Paper and MSP Act may offer some insights. The Green Paper was published in 2012, the White Paper in May of 2014 and the Act in 2019. The Operation Phakisa: Ocean Programme was developed and launched from August to October 2014. The Phakisa Programme identified that a marine spatial planning process will offer support to the rapid development of the South African Ocean Economy (DEA, 2014). This probably resulted in the MSP focus of the Bill and Act. There is however the need to contemplate the policy formalisation of the other components of the White Paper, which remain unresolved.

The discussion of the governance context for implementing the White Paper and the MSP Act is revisited in Chapters Seven and Eight, with more insights from interviews with officials responsible for implementation. In addition to MSP, the White Paper also adds to and advances the existing policy landscape because it makes a direct link between management of the national ocean jurisdiction to that of regional, High Seas and Antarctic ocean management. This concept is further discussed in the Chapter Five.

3.8. Discussion

The White Paper on the National Environmental Management of the Oceans (NEMO, 2014) improved over the Green Paper on the National Environmental Management of the Oceans (NEMO, 2012) with the definition of ocean governance Priority Statements and also describing a set of Guiding Principles. The White Paper is biased towards a conservation over a sustainable development agenda. The Green Paper represented a very comprehensive description of the potential governance roles, duties and responsibilities of the South African Government with regards to ocean management.

The four themes identified in the South Africa Ocean Policy Green and White Papers are linked to sustainable development of the ocean as a resource. The Policy Papers also include more recent global agendas such as maintenance of ecosystem integrity and functioning; growing resilience; and restoration of damaged systems.

Both the historical and emerging threats are addressed to varying degrees in the Green and White Papers which call for understanding and management of these threats. There is an attempt to future proof the NEMO White Paper by including future uses such as carbon capture and storage in the sea bottom and other forms of geo-engineering in the Priority Statements.

The White Paper does not provide details on institutional structures. The White Paper only stipulates that Government will use the existing cluster arrangement of the South African Cabinet as the mechanism to process marine spatial planning. The South African Ministries and the respective departments are arranged into clusters addressing various themes such as Welfare, International Relations, Security and Economic Development[2]. The Economic Cabinet Cluster is designated by the White Paper as being responsible for Ocean Governance, with Minister of Water and Environmental Affairs nominated to coordinate this work across Departments. This Ministry was, in 2015, disaggregated into the Minister of Water and Sanitation and the Minister of Environmental Affairs, resulting in the dedicated Ministry of Environmental Affairs coordinating the ocean governance and marine spatial planning work. Since 2015, this Ministry has published the Marine Spatial Planning Bill (Marine Spatial Planning Bill, 2017) and the Act in 2019 (MSPA, 2019). Parallel to the publication of the Bill, the Marine Spatial Planning Framework was published as a guideline to the envisaged process of the MSP (Marine Spatial Planning Framework, 2017).

The MSP Act (section 9, 10 and 11) focuses on institutional arrangements and decision-making processes and authorities (MSPA, 2019). While this does clarify the leadership roles to some extent, it appears to have maximised inclusion of sector departments such that all structures have a large number of departments and ministries represented. A total number of 13 Departments are included. This will now reflect 12 Ministries since 2019, when the fisheries management function was moved to the Department of Environmental Affairs and away from the Department of Agriculture.

South Africa will have to evaluate its selection of the Department of Environmental Affairs to coordinate marine governance and spatial planning. The Department of Environmental Affairs will be perceived as having a conservation approach and the

[2] A description of the Government Clusters, as well as the new government ministry names after the 2019 reorganisation can be viewed at https://www.gov.za/government-clusters.

economic actors in marine spatial planning may validly express concerns of being negatively biased and represented. This perception is discussed in Chapter Seven which provides learnings from interviews with key informants from the various sector departments.

In the discussion above, where the current South African Government Priorities are described, economic growth is raised as overarching pressure on Government. The question that becomes evident then, is can or should the Department of Environmental Affairs be tasked with driving an economic development focused ocean agenda? An argument can be made that Environmental Affairs is a suitable agency to build an economic programme that is natural resource based, as the Department will focus on sustainable growth while taking a precautionary approach not to alter and damage ecosystem integrity. Among the Government Departments and Ministers in South Africa, there does exist the Department of Trade, Industry and Competition. This Department and Minister also represents a potential candidate champion for the ocean economy development and its associated processes like MSP. The Government of Indonesia represents an example of a high measure of maritime governance coordination with a direct link to economic growth by including in its set of ministries: The Coordinating Ministry for Maritime and Investment Affairs (Government of Indonesia, 2020).

Similar to the nomination of lead departments, a critical supporting institutional arrangement, is the creation of an information platform on which the various national industrial sectors or departments can simultaneously access up-to-date information to effectively engage in the MSP process. This concept of shared information platform is contained in the White Paper, having its own Priority Statement but the Paper lacked in providing an owner and champion for this system. This is corrected in the MSP Act (MSPA, 2019, Section 7) with the Minister of Environmental Affairs tasked with establishing a knowledge and information system to support the development of marine spatial plans. The Act stipulates that departments must submit all sector information required by the Minister and these are to be housed in the information system. This does empower the Minister and the Department of Environmental Affairs to collect the data required. This is however still dependent on the capacity that departments have to engage in the marine spatial planning processes including data collection, collation and submission.

The objectives of sustainable development and conservation, including across generations are very much evident in the national policies reviewed. The reviewed national ocean policies however, also talk to more nationalistic objectives of growing the ocean economy and proactively using the strategic advantages of ocean natural assets and resources in the national interest. These national development or economic and political objectives are placed at least on an equal footing to other objectives such as improving research for conservation, MSP and the management of pollution. The South Africa Green and White Policy Papers do not articulate this national interest perspective as overtly. The articulation of priorities in the White Paper does appear to be biased towards conservation rather than development of the ocean economy. The White Paper in Priority Statement 3.3.2 refers to the management plans as "spatial ecosystem and biodiversity management plans" that "will facilitate the identification of potential or new economic opportunities while offering maximum protection to threatened species and ecosystems" (NEMO, 2014, p. 16). The South Africa White Paper on Ocean Governance then appears to clearly articulate conservation as a priority.

This may be due to the Green and White Papers on Ocean Governance for South Africa being developed by the Department of Environmental Affairs (DEA). This is a discussion or criticism that the DEA will have to defend and allay when coordinating the MSP processes and negotiations. The bias towards conservation is not necessarily a criticism of the White Paper. This could be a result of South Africa wanting to articulate its role and responsibility in management of its biodiversity. These are the sentiments often articulated in the group of mega-biodiverse countries to which South Africa belongs (Bacon et al., 2019).

Another strategic concept noted in the review of other country national policies is that of using shared Large Marine Ecosystems as a platform to coordinate regional and international programmes. This can be achieved both at the immediate national mainland coastal level but also where colonising or annexing countries have distant ocean and island territories. Neighbouring and overlapping ocean jurisdictions can present unique circumstances in geo-politics. South Africa may for instance include France in its list of geographic neighbours, as France and South Africa exercise political jurisdiction over neighbouring ocean islands, the Crozet Islands and Prince Edward Islands respectively. The United Kingdom and Norway also hold jurisdiction over ocean islands in the latitudes between southern African and Antarctic. The NEMO policy articulates South Africa's international ocean governance aspirations in last five priority statements (Ibid., 18). It appears that much emphasis is placed on alignment and coordination across countries sharing South Africa marine ecosystems within and outside national jurisdictions in the High Seas Area. Details on the areas of alignment are not provided beyond improved research collaboration and equitable access and benefit sharing for High Sea and Antarctic Resources[3]. This concept is further explored in Chapter 5.

The White Paper further elaborates on the threat issues raised by the Green Paper by describing existing and emerging threats to the oceans and coastal ecosystems in the Priority Statements, and often including actions to be undertaken by Government such as the setting of thresholds or defining best practice. As the White Paper does not identify all of the anthropogenic threats, this does raise the question as why some threats are raised and not others (NEMO, 2014, Section 6). The threats selected do appear to identify emerging issues such as ocean geo-engineering, iron fertilisation, deep sea mining and the transport of noxious chemicals. Although sewage and alien invasive species, both long standing pollution issues are also raised. Plastic, microplastic and noise pollution which have been receiving increased international attention are however not raised (Lebreton et al., 2019; Williams et al., 2019). The Department of Environmental Affairs, as drafter of the

[3] Towards the end of the study in March 2020; the South African Cabinet approved a draft Antarctica Strategy for public comment, the publication was not available during the analyses period of the study.

White Paper, will have to clarify this selection or alternatively amend this selection to make it broader to cover the full spectrum of anthropogenic pollution impacts.

Through the specific mention of selected threats, the Priority Statements of the White Paper adds an emphasis that was not included in the Green Paper. This detail will allow for the setting of strategic priorities and actions that can be addressed specifically during the creation of spatial plans. If South Africa could elaborate on its tolerated levels of acceptable impact, this will have the added advantage of contributing to upfront considerations for trade-offs or balancing decisions in deciding on overlapping or competing uses in the MSP process. Research in countries like Switzerland have extended this concept to calculating national priority limits from planetary boundary limits (Dao et al., 2019). The European Union has also defined pollution targets to some extent and these thresholds are discussed in Section 4.3.2 below. Criteria for MSP decisions will be further contemplated in Chapter Six.

Noticeably, timelines or target dates for the actions around management of pollution impacts or development of spatial plans are not defined in the White Paper. The MSP Act also does not contain any details around the management of anthropogenic pollution, emerging or existing. Nor does it contain any detail around biodiversity management other than sustainability and environmental impact considerations in the principles and criteria for marine spatial planning. The MSP Act is focused only on the MSP process (MSPA, 2019). This does raise the question - will there be a separate Act for the Priority Statements of the White Paper regarding the biodiversity, ecosystem, species and pollution management? The Green Paper concluded with considerations of an Oceans Act for South Africa but this consideration is absent from the conclusion of the White Paper.

Outreach, awareness raising and capacity building are concepts that are raised in several countries' ocean policies. This is a commonality that is not highlighted in the South African White Paper. This would be very significant for South Africa given that the country, like many other countries in Sub-Saharan Africa, has a history of terrestrial farming and mining as the core economic and social activities (Pijpers, 2014). Awareness programmes will improve both citizen and industry engagement with the ocean (Cigliano, 2018; McCauley et al., 2019). The White Paper also does not articulate the role of coastal communities and labour representation in both developing management interventions or inclusion in the consulting process towards approval, and implementation. The role and coordination across ocean sector departments is however discussed and this may inherently include that sector departments will undertake such stakeholder consultation considerations in developing their respective sector contributions to the marine spatial planning process. Sector departments consulting their stakeholders is articulated in the MSP Act. Section Eight of the MSP Act is dedicated to consultation, and asks that all stakeholders be adequately consulted. This must be seen as an improvement over the White Paper, as the intention for stakeholder consultation is clear.

All decisions of the Convention of Biological Diversity (CBD) stress the importance of including local communities and incorporating traditional knowledge to complete the knowledge base on which management decisions are made (Tengö et al., 2017). Such an inclusive working process for MSP will require a broad interpretation of the consultation provision provided for in the MSP Act. Consultation in its narrow definition will not include participatory co-development of marine spatial plans. The emerging critical consideration for inclusive marine spatial planning processes is discussed in the Chapter Seven and Eight.

This Chapter of the study concludes that South African White Paper on the National Environmental Management of the Oceans (NEMO, 2014) does present concepts that are new to the marine environmental management policy landscape of South Africa, namely marine spatial planning. Other environmental policies of South Africa can be categorized broadly into two areas: policies that relate to the broad aspects of environmental management which are not specific to marine ecosystems and those that are specific to marine ecosystems.

All South African environmental policies fall under the broad ambit of the National Environmental Act of South Africa – NEMA (NEMA, 1998). NEMA responds ultimately to Section 24 of the Constitution, described in Section 1.3 above. Environmental management policies are generally written to align with the NEMA and are regarded as Specific Environmental Management Act or SEMAs, except for the Marine Living Resources Act – MLRA (MLRA, 1998), which defers only to the Constitution, and may then be viewed as parallel to NEMA. This maybe as a result of both Acts being developed in parallel and promulgated in 1998.

The Marine Living Resources Act and the Integrated Coastal Management Act - ICMA (ICMA, 2009) speak directly to marine environmental management. Other SEMAs like the National Environmental Management Protected Areas Act (NEMPAA, 2004) and the National Environmental Management Biodiversity Act (NEMBA, 2004) can relate to both terrestrial and marine environmental management. The definitions in these Acts do not exclude any part of the environment, and therefore can broadly be interpreted to include the marine – oceans and coasts environment.

Like the ICMA, the NEMO White Paper describes a sustainable development approach to environmental management processes and objectives for the marine ecosystems. The ICMA has a coastal focus and devotes much of its content to the management, regulating and permitting of the human activities along the coast (ICMA, 2009). The NEMO White Paper describes a management approach for the Ocean Areas. It differs from the ICMA as it does not describe regulation and permitting of human activities but does describe a method for inter-governmental cooperation to develop and implement marine spatial plans and includes considerations for actions to address historic and emerging threats to environmental integrity.

Marine spatial planning, is the primary area of advancement offered by the White Paper over existing environmental policies in South Africa for ocean areas. It is the key new contribution that the NEMO White Paper makes to the environmental management policy landscape that already exists in South Africa. Certainly, cooperative governance is articulated in the other policies such as NEMA, which devotes much of its character to government working across its tiers and entities. However, the implementation of these processes has not always enjoyed the envisaged success over the last 20 years (Bosman et al., 2004). The ICMA also specifically aims to provide a basis for cooperative governance across National, Provincial and Local government structures that exist in South Africa, such as the Provincial and National Coastal Committees which have been functioning over the recent years since the promulgation of the ICM Act in 2009 (Colenbrander, 2019). The Coastal Committees are focused on coastal zone management.

When considering a broader array of national ocean policies than the ones selected in the Green paper; similar trends in integration and coordination; science and knowledge bases; marine spatial planning; ecosystem based management, pollution mitigation and stakeholder participation and inclusive management are identified. Cicin-Sain and co-editors provide a comprehensive review of 15 nations ocean polices, and include ocean policies from East Asia Seas, European Union; Jamaica, Mexico; Pacific Islands and the United Kingdom additional to the national policies included in this review (Cicin-Sain et al., 2015). In this review developing countries like Mexico and Island States such as Jamaica, Pacific Islands and East Asia Seas include partnerships and co-management with stakeholders in their operational objectives. This observation reinforces that the South African policy could have emphasised these aspects more. The possible consequences of these are discussed in Chapter Eight. This discussion accentuates that spatial management plans have a larger likelihood of success if stakeholders, including communities, citizens, labour and civil society organisations are included meaningfully in the development of co-management arrangements. South African has previously experimented with co-management and transformation implementation in Fisheries, with mixed successes that could be built on in the MSP implementation (Hara & Raakjær, 2009; Nielsen & Hara, 2006).

In developing its policy priorities, the NEMO White Paper draws on both the Aichi Targets (CBD, 2010) and the Sustainable Development Goals (UN General Asssembly, 2015) which represent the most recent configuration in the global agenda forums on sustainable development, conservation and protection. As a party to the Convention on Biodiversity, South Africa must produce periodically National Biodiversity Strategic Action Plans. South Africa had produced its last one in 2015 (National Biodiversity Strategy and Action Plan, 2015). This does not give direction specifically on oceans and coasts governance, it does incorporate aspects of conservation and protection such as describing the marine protected area targets, compliance measures, and environmental benefit sharing, especially for the poor and rural communities. These considerations will have to be extended to the coastal and ocean ecosystems.

A noticeable omission in the NEMO is the recent oceans agenda regarding the United Nations Framework Convention on Climate Change (UNFCCC). While ocean fertilization, carbon capture and storage are addressed in the NEMO White Paper, the emerging aspect of Blue Carbon and the role of the ocean and coastal wetlands in natural carbon sequestration is not specifically discussed. Blue carbon discussions are now broader than carbon sequestration and storage but includes the planetary role of natural ocean processes (Howard et al., 2014). The South African Green Paper on Ocean Governance, did include considerations of the South African White Paper on Climate Change but this is translated in a limited manner into trend analysis, forecasting and prediction of weather in the Priority Statements of the White Paper. The White Paper also notes that the Department of Environmental Affairs (DEA) will define regulatory frameworks for emerging uses like carbon storage. This is the only time the DEA is mentioned specifically in the White Paper other than the coordination role of MSP. All other government references in the White Paper only use the general title “Government” without specifying any department. The Blue Carbon concepts and the role of the ocean will have to be incorporated in future revisions of the policy or these aspects can be included in a revision of the White Paper on Climate Change, or Climate Change Act if such an Act is drafted.

4. Marine Information and Knowledge Requirements for Implementing the White Paper on the South African Policy for the National Environmental Management of the Ocean

4.1. Introduction

The South African White Paper on the National Environmental Management Policy for the Ocean - NEMO (NEMO, 2014) seeks to provide a platform for the sustainable development of the ocean by building economic return from the ocean and promoting conservation. South Africa's Ocean Exclusive Economic Zone remains relatively unexplored, with only fisheries surveys dominating the ocean survey activity over the last century (Payne & Lutjeharms, 1997).

The NEMO policy presents Marine Spatial Planning (MSP) as the framework for ocean sustainable development and premises this framework on the ability of decision makers to make choices on ocean use based on suitable knowledge of resource potential and ecosystem thresholds for exploitation and impact. It is globally acknowledged that the ocean is underexplored, that more information is required and this information must integrate knowledge across basic science to societal benefits (Halpern et al., 2012b; Visbeck, 2018). There is also growing appreciation that, with the ocean being the dominant feature of the planet's surface, understanding processes and forecasting scenarios must be linked with understanding the role of the ocean in planetary processes (Harrould-Kolieb & Herr, 2012; Ruckelshaus et al., 2013; Howard et al., 2013; Miloslavich et al., 2018).

The implementation of the NEMO policy will be dependent on a sound information and knowledge platform. This platform must incorporate best available information and define a process to routinely gather new information and progressively generate knowledge on the state and functioning of ocean and coastal ecosystems, thresholds for impact and ocean resources potential. This chapter will define the information and knowledge key performance areas or requirements for policy implementation through analyses of the Strategic Priorities contained in the NEMO White Paper

(NEMO, 2014, Section 6). These information and knowledge or science key performance areas will then be matched against national marine science output in South Africa. The marine science output in South Africa will be assessed through analyses of the science performance areas of publicly funded national marine science agencies.

Internationally there have been efforts to develop information requirements for assessing the status, observing the functioning and surveying of marine environments. These data and information collections are undertaken to determine the effectiveness of policy implementation, or as base knowledge for policy interventions. The European Union in 2017 published such criteria and methodological standards for monitoring and assessing marine waters (European Commission, 2017). The Intergovernmental Oceanographic Commission of UNESCO has also, through its Global Ocean Observing System, published a list of Essential Ocean Variables - EOVs (UNESCO, 2018a). It encourages countries to monitor and study these EOVs so that local and regional science efforts can contribute to global assessments.

The United Nations has also been proactive in increasing the profile and attention given to the science of the ocean and has declared 2021 to 2030 as the Decade of Ocean Science, and is planning to develop a comprehensive science plan for the ocean from 2018 to 2020 (UNESCO, 2018b, 2018c). This is in response to growing recognition of the ocean as key to global development over the next century from both opportunities and threats perspectives.

The Chapter will conclude with an assessment of the current South African marine information and knowledge output and its ability to support the objectives of the White Paper, including comment of how this output compares to ocean monitoring and science that is suggested internationally. The analysis provides insights into content or focus reforms that may be required at the level of the science agencies. The conclusion will include recommendations on areas of research and monitoring that require investment.

4.2. Research Methods

The Strategic Priorities and Priority Statements of NEMO White Paper (NEMO, 2014, Section 6, pp. 11-18) were analysed to assess the information and knowledge requirements for implementation. These requirements were generally derived from the Priority Statements that included actions to be undertaken. Once these knowledge requirements were identified, they were categorized into Key Performance Areas and matched against active science areas described from government funded marine science organisations. As an initial step to this process, all of the publicly funded ocean and coasts related research, monitoring and science organisations were identified. Science Programmes relating to the ocean and coasts were identified in the various government departments by undertaking a search on all of the national department's websites. Website menus were searched two levels down in addition to the landing page to identify ocean and coasts related work. The key words ocean(s), coast (s)(al), marine and maritime were used separately to search Department websites using the search tool of the websites where these existed. The primary web pages of national departments were searched, as well as web pages of the various department's state-owned entities. Key science output themes and annual funding figures for the 2017/18 or latest available financial year were derived from departments or funded entities annual business and performance plans. An additional source for identifying performance areas and funding data was the 2018/19 Estimate of National Expenditure (ENE), which is produced by the National Treasury of South Africa and lists all of the government departments forecasted funding and major expenditure items (South African National Treasury, 2018b). The ENE document was also used where possible to confirm programmes and funding allocations identified in the internet searches of the national department websites. Ocean and coasts related science and monitoring programmes at provincial and local governments were not considered in this study.

Universities represented more difficult organisations in which to identify ocean and coasts related science programmes. Science programmes can occur at various scales from broad programmes to single projects within departments. Like national departments, university web pages were interrogated to the 3rd menu level and also searched with the key words: ocean(s), coast (al)(s), marine and maritime. For this study, university activities were only included in the discussion if the university had ocean and coasts dedicated programmes or departments rather than single or narrow individual funded project level work. While such smaller marine science programmes may have been known to the researcher/student through other information sources, such programmes were not included in the study if they were not visible from the search of websites. Websites were selected as a means to identify ocean and coasts research programmes because websites are designed by university managers and are used to profile the strengths and strategic focus of the university or research agency. As is the case with all analyses of web-based materials, there is a time dependence to the results, as these sites do change in structure and content. Access dates for the websites interrogated are provided in the references. Since the study was undertaken, science entities and departments may have re-organised the focus of their work. The study therefore provides an assessment of the state of science key performance areas that were reflected during the study period. There is however some inertia limiting the changing of strategies and research programmes of government departments. Funding in the South African Government occurs in rolling cycles of three years called the Medium Term Expenditure Framework (South African National Treasury, 2018a). Similarly, science programmes are generally funded for three years, including the Department of Science and Technology's Programmes (see footnote six ([6]) for link to description of funded research programmes). The cycles of funding are linked to the Government Strategic Plans which run over five years, the last one covering the period 2015/16 to 2019/20, spanning the period between national elections. Drastic year on year changes across all departments are then unlikely within the five year period. The study therefore does provide an overview of the current science key performance areas.

The websites, strategic and or business plans of the identified marine science organisations (including universities) were assessed and then matched against the information and knowledge key performance areas identified as necessary for the implementation of the NEMO White Paper. This analysis allowed for two measurements. The first being an assessment of the spread of science output from the various science units or agencies over the requirements, to identify which areas are covered and if they are any areas of knowledge output that are not covered. The second measurement assessed if individual science agencies had a broad or narrow scope. Alternatively stated, this second measurement assessed if individual agencies respond to one, few or several of the information and knowledge key performance areas. These measurements where undertaken to assess if South Africa is producing the necessary science output across the range of requirements to support the implementation the NEMO policy.

The information and knowledge key performance areas required by the NEMO White Paper were also compared to international trends in marine science requirements for policy implementation to assess how South Africa's ocean policy science requirements reflect global trends i.e. is South Africa defining and prioritizing similar information and knowledge requirements to those that are being internationally recognized? International trends in science for ocean policy implementation is drawn from the European Union which has published a detailed methodology of information to be collected to determine the status of marine ecosystems (European Commission, 2017). Additionally, information requirements for the management of the ocean were interpreted from the work of the Global Oceans Observing System (GOOS) of the United Nations Intergovernmental Oceanographic Commission, which has proposed a set of essential ocean variables or EOVs (UNESCO, 2018a).

4.3. Information Requirements for the Implementation of NEMO

The Strategic Priorities of the NEMO White Paper (NEMO, 2014), being the areas of action of the Policy, were analysed to determine the information or knowledge requirements necessary for their implementation. The White Paper describes its overall policy approach in four themes, which are further elaborated into nine Strategic Priorities containing 34 Priority Statements. The Priority Statements call for various actions to give effect to the Strategic Priorities and provides descriptions of potential governance impact through various types of knowledge products and outputs of analyses.

4.3.1. Information Requirements per NEMO Priority Statements

The Strategic Priorities of the NEMO Policy are used as categories of the Information or Knowledge Areas. Table 2 contains the Strategic Priorities[4] in column 1, with suggested possible knowledge product and output types in column 2. Table 2 then elaborates on the possible observations or data sets (column 3), science processes (column 4) and knowledge products or key performance areas (column 5) that can be associated with each of the Priorities. Based on Table 2, categories of datasets and science key performance areas are then illustrated in Figure 6, which describes a process map from datasets through to knowledge products that will support the implementation of the NEMO White Paper (NEMO, 2014). This process map is an output of the study's investigation. Figure 6 also includes the NEMO policy concept: that for the collection of data and generation of knowledge products to impactful, there must be an information sharing system, and iterative cycles that will allow for the refining of observations, science and knowledge products.

[4] The Strategic Priorities, and the Summary of Knowledge Product and Analysis Output Types are derived from the NEMO White Paper (DEA, 2014, pp. 12-18).

Table 2. Description of the NEMO White Paper Priority Statements and an Interpretation of Supporting Datasets, Science and Knowledge Products

	Information or Knowledge Area Category	Summary of Knowledge Product or Output Types	Observation Parameters or Data Collections	Analyses or Science Processes	Knowledge Product / Key Performance Area
No.	Strategic Priority				
1.1	Facilitate improved adherence with the ocean environmental reporting requirements contained in the National Environmental Management Act and associated domestic legislation	Sector Use; Sector Impact / Pollution. Environmental Status / Indicators; Integrated Reports.	Environmental Management Activities from Ocean Sectors; Environmental Information (Living & Non-Living Aspects) - Indicators will require essential ocean environmental variables to be monitored.	Define Indictors for Environmental Health	Status Report for Ocean Environment
1.2	Enhance research, monitoring and conservation of ocean ecosystems while supporting sustainable development opportunities.	Spatial Mapping: natural process understanding; pollution impact, living & non-living resources; Technology Advancement; Data & Information Archives.	Spatial Surveys for geology; biodiversity, physics and chemistry observations. Performance data on existing and developing ocean monitoring technologies.	Identification or assessment of living & non-living resource potential. Map biodiversity & classification of habitat types. Define ocean processes. Assess pollution impact. Assess & evaluate technology applications.	Spatial Maps of biodiversity, pollution impact & resource potential. Process maps of ocean system functioning. Identification & or description of optimal technology solutions for South African ocean user requirements.

	Information or Knowledge Area Category	Summary of Knowledge Product or Output Types	Observation Parameters or Data Collections	Analyses or Science Processes	Knowledge Product / Key Performance Area
2.1	Produce knowledge products and information tools to facilitate knowledge and understanding of economic potential, the natural functioning of ecosystems, human impact on the ocean environment and the promotion of sustainable development opportunities.	Building of a South African Ocean Atlas, within an Oceans and Coast information System; Ocean surveying, exploration & mapping.	Surveys & mapping exercises.	Develop utilisation patterns; Identify knowledge gaps. Generate scenarios, trends & predictions to inform sectoral decision making. Aggregate environmental information.	South African Ocean Atlas; Oceans & Coastal Information System, Sector Use Maps; Use profiles, trends & scenarios to assist in ocean use planning.
2.2	Establish agreed ocean ecosystem thresholds using the best available information.	Monitoring indicators so that there can be adaptive management when predetermined thresholds are reached.	Observations of Indicators.	Determine Indicators & or variables that indicators require. Determine thresholds for action. Determine suitable actions & desired outcomes.	Essential Ocean Variables for SA to monitor; Indicators for Ocean Systems; Thresholds for Action; Set of Action Options for various threshold levels & types.
2.3	Provide knowledge to promote sustainable development while maintaining the integrity of the ocean.	Spatial maps that are publicly available to assist in identification of resources & opportunities. Indicators & thresholds developed at the level of spatial zones for facilitating direct ocean investments.	Engineering & technology testing & optimisation.	Develop indicators & thresholds at required spatial resolution. Develop technology & engineering ocean applications.	Spatial Maps that are Publicly Accessible that identify existing, potential & new resource opportunities. Technology & engineering solutions that support ocean exploration, monitoring & development.

	Information or Knowledge Area Category	Summary of Knowledge Product or Output Types	Observation Parameters or Data Collections	Analyses or Science Processes	Knowledge Product / Key Performance Area
3.1	Provide timeous information on trends and extremes in ecosystem and earth system functioning to improve responses to extreme weather events and inform adaptation measures.	Collecting observations in suitable time & space resolution to develop scenarios & predictions of ecosystems, weather and climate variation & change to facilitate better adaptation for society & industry.	Monitoring of key environmental variables over long periods.	Assessment of trends & building of predictions & forecasts of ecosystem & climate variability & change.	Climate change & ecosystem functioning forecasts & scenarios on potential & probability of change to ecosystem services.
3.2	Promote the conservation, protection and rehabilitation of ocean ecosystems including habitat and species.	Scoping and Facilitating the conservation, protection, rehabilitation through engaging with sector departments, identify and filling of regulatory gaps for novel ocean uses, prioritising threatened or vulnerable species & habitats. Scoping and fulfilling international obligations.	Monitoring & information gathering on environmental management activities across sector departments. Monitoring applications for novel ocean uses. Surveying potential MPAs. Monitor status of degraded habitats & threatened species. Monitor international agreements for decisions on conservation targets & practices.	Develop environmental management interventions that can be implemented through permitting processes of sector departments. Identify novel oceans uses & develop appropriate regulatory frameworks. Develop recommendations on networks of MPAs. Compile internationally & relevant agreed targets for marine conservation.	Proposals on Sector specific environmental management interventions. Proposals on regulatory frameworks for novel ocean uses. Proposals on networks of marine protected areas, habitat and species conservation. Collated set of nationally relevant & internationally agreed environmental management targets.

	Information or Knowledge Area Category	Summary of Knowledge Product or Output Types	Observation Parameters or Data Collections	Analyses or Science Processes	Knowledge Product / Key Performance Area
3.3	Establish biodiversity management plans for ecosystems and species	Developing marine spatial management plans that include biodiversity management plans that consider accumulated & aggregated impacts. Developing of norms & standards for marine industries. Management plans in the ocean will emphasise the inclusion of heritage sites; risks associated with harmful & noxious substances; treatment of sewage & industrial waste; & management of alien & invasive species.	Surveying of marine ecosystems for biodiversity & living and non-living resources. Measuring individual & collective impacts of ocean sectors. Surveying of marine cultural sites. Monitoring harmful & noxious substances transported on the ocean. Monitoring of sewage & industrial waste entering the ocean. Monitoring the use & incidences of marine alien & invasive species.	Assessing the impacts of individual sectors & accumulated & aggregated impacts. Investigating optimal norms & standards for ocean sectors. Analysing trade-offs & co-existence of ocean sectors. Investigating & assessing marine cultural sites. Assessing the risk profile of harmful & noxious substances; sewage & industrial waste; marine alien & invasive species & recommending risk management options.	Defined individual & combined environmental impacts of ocean sectors. Proposals on norms & standards for ocean sectors. Scenarios & proposals on trade-offs & balancing ocean sectors in marine spatial plans. Defined set of marine cultural sites. Ocean & coasts risk profiles of harmful & noxious substances; sewage & industrial waste; & alien & invasive species. Risk management options for harmful & noxious substances; sewage & industrial waste; & alien & invasive species.

	Information or Knowledge Area Category	Summary of Knowledge Product or Output Types	Observation Parameters or Data Collections	Analyses or Science Processes	Knowledge Product / Key Performance Area
4.1	Cooperate at a national, bi-lateral, regional and international level to advance sustainable ecosystem-based management of the EEZ, Continental Shelf, High Seas and Antarctica.	Promoting ocean environmental integrity through cooperation at the national, regional & global levels. Moving towards an integrated approach to ocean governance using the ecosystem-based approach. Developing marine spatial plans for East, South, West Coasts & the Prince Edward Islands ocean areas. Producing annual State of Marine Environment Reports. Engagement at international forums to promote equitable access to & benefit sharing of resources in the High Seas & Antarctica. Undertaking of large-scale research projects to improve regional environmental planning & national adaptation.	Observing variables & monitoring processes at local to ecosystems scales. Observing strategies of oceans policies of neighbouring countries. Observing & monitoring decisions & objectives of regional & global ocean related conventions.	Describing & explaining processes, variability, shifts & changes at the level of ecosystems. Assessing areas of convergence & divergence with neighbouring countries ocean policies. Assessing regional & global conventions for national relevance & implementation.	Defined natural ecosystem processes at the level of Large Marine Ecosystems & implications for marine spatial planning. Proposals on strategies to engage neighbouring countries on ocean policy objectives & implementation. Proposals on strategy to engage regional and global conventions on policy objectives & implementation.

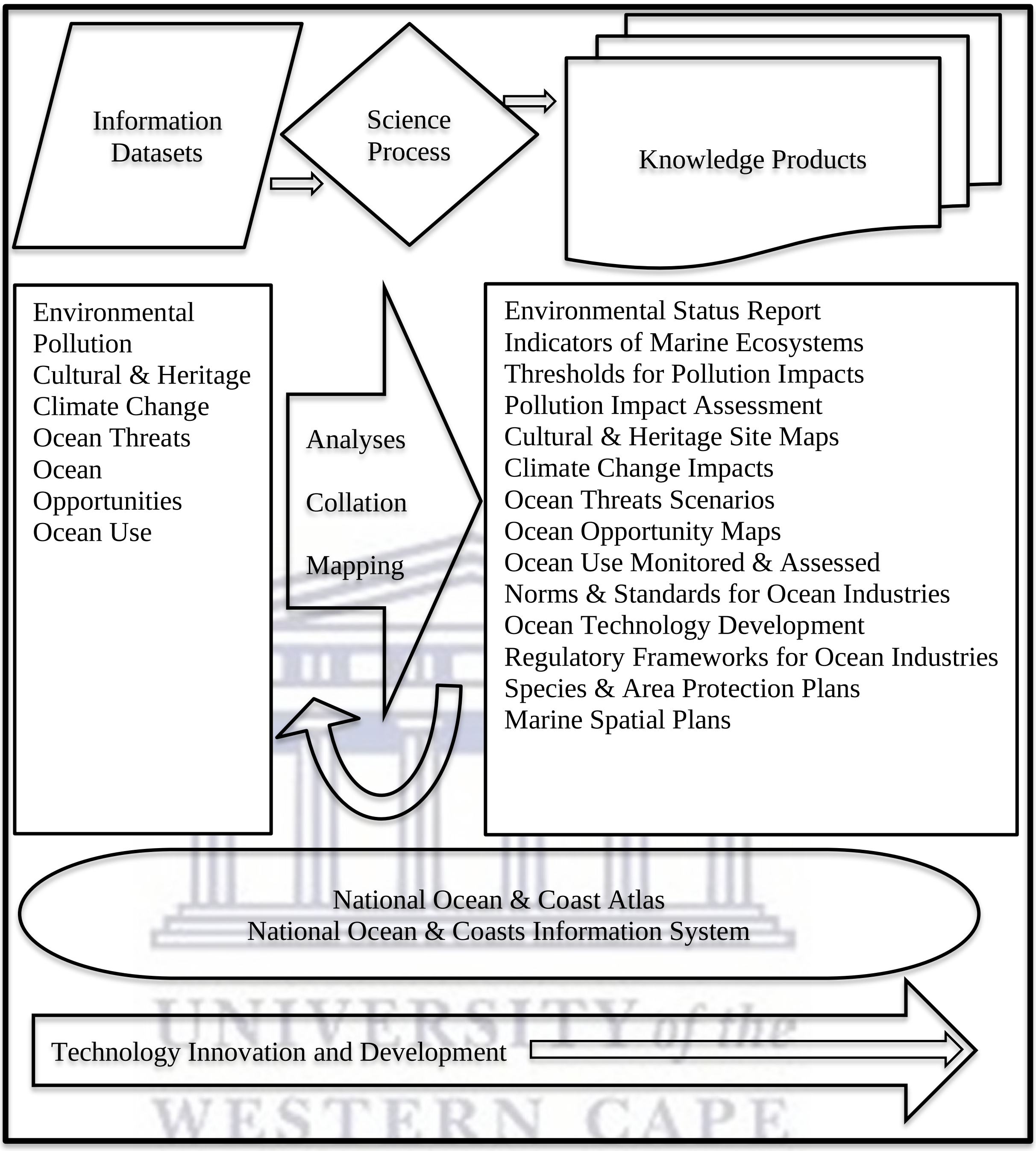

Figure 6. Process Map of Datasets, Science Processes and Knowledge Products Described for the NEMO White Paper.

Figure 6 provides an interpretation of the science support framework for the implementation of the NEMO White Paper. The collection of data, undertaking of science and production of knowledge products are intended to be an iterative feedback loop that identifies gaps and new datasets, and enhances science towards the development of more relevant knowledge products. The left side column in Figure 6 defines information categories or data sets that will be derived from observations and surveys. These must be taken through various scientific processes to produce knowledge products defined in right side column. The knowledge products can be applied in the management of marine resources and ecosystems. The White Paper describes a National Oceans and Coast Information System to house all data and data products. This information system must also be the platform that facilitates easy distribution of the data to sector departments and public users, through the provision of a National Ocean Atlas. The NEMO White Paper further advocates that there must be a continuous investment in technology development for improved ocean environmental observations and for the support and development of ocean industrial sectors.

4.3.2. International Trends in Ocean Governance Information Requirements

International trends in the information and knowledge requirements for the implementation of ocean and coast policies are derived from two primary sources in this study: a) the European Union 2017 decision on assessing the state of marine waters and b) the recommendations on ocean monitoring by the United Nations Educational, Scientific and Cultural Organisation’s (UNESCO) Intergovernmental Oceanographic Commission (IOC).

a) The European Union has been actively promoting the common custodianship of marine ecosystems for the last two decades through the formal adoption of the Marine Strategy Framework Directive (European Parliament & Council of the European Union, 2008). More recently, in 2017, the European Union has adopted a decision on the evaluation of the status of marine environments (European Commission, 2017). This Decision describes data to be collected in the form of criteria that are categorized into descriptors or themes. Some descriptors are linked to existing threshold values, and where these don’t exist member countries are asked to define these. Descriptor and theme categories are defined in two parts in this decision on assessing the status of marine waters. Part 1 comprises descriptors dealing with monitoring and assessment of predominant pressures and their impacts. Part 2 comprises themes dealing with monitoring and assessment of essential features or characteristics and environmental status of marine waters. Together these variables are essentially used to monitor and assess the pollution pressures, and the living and non-living aspects of ecosystems. Assessments are achieved through surveys that establish baselines and subsequent monitoring to determine trends. Environment Descriptors from Part 1 and Environmental Themes from Part 2 of the EU Decision on the Evaluation of the Status of Marine Environments are listed in Table 3. (Part 1 has 9 categories and Part 2 has 4 categories.)

Table 3. European Union Environmental Descriptors and Themes for the Evaluation of the Status of Marine Environments (European Commission, 2017).

Part 1: Monitoring and assessment of predominant pressures and their impacts on marine waters. Environmental Descriptors	**Part 2: Monitoring and assessment of essential features or characteristics and current environmental status of marine waters.** Environmental Themes
Non-indigenous species introduced by human activities are at levels that do not adversely affect the ecosystems	Species groups of birds, mammals, reptiles, fish & cephalopods
Populations of all commercially-exploited fish & shellfish are within safe biological limits, exhibiting a population age & size distribution that is indicative of a healthy stock	Pelagic habitats
Human induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms & oxygen deficiency in bottom waters	Benthic habitats
Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded & benthic ecosystems, in particular, are not adversely affected	Ecosystems including food webs
Permanent alteration of hydrological conditions does not adversely affect marine ecosystems	
Concentrations of contaminants are at a level that does not give rise to pollution effects	
Contaminants in fish & other seafood for human consumption do not exceed levels established by Union legislation or other relevant standards	
Properties & quantities of marine litter do not cause harm to the coastal & marine environment	
Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment	

b) The Intergovernmental Oceanographic Commission (IOC) of UNESCO coordinates the work of the Global Ocean Observing System – GOOS. GOOS is comprised of a multinational expert group that advises and recommends standards on ocean monitoring. GOOS, through the working of three focused working groups, has developed a set of Essential Ocean Variables - EOVs (UNESCO, 2018a) for Ocean Physics; Biogeochemistry; and Biology and Ecosystems. These variables are set out Table 4. The variables are selected because they directly relate to the working themes of GOOS which are Climate, Operational Ocean Services and Ocean Health. Additionally, variables are selected because they are feasible and cost effective, often relying on proven technology and coordinated across existing and planned ocean observing systems.

Table 4. Essential Ocean Variables as recommended by the Global Observing System – GOOS (UNESCO, 2018a).

No.	Physics	Biogeochemistry	Biology and Ecosystems
1	Sea state	Oxygen	Phytoplankton biomass & diversity
2	Ocean surface stress	Nutrients	Zooplankton biomass & diversity
3	Sea surface height	Inorganic carbon	Fish abundance & distribution
4	Sea surface temperature	Transient tracers	Marine turtles, birds, mammal's abundance & distribution
5	Subsurface temperature	Particulate matter	Hard coral cover & composition
6	Surface currents	Nitrous oxide	Seagrass cover
7	Subsurface currents	Stable carbon isotopes	Macroalgal canopy cover
8	Sea surface salinity	Dissolved organic carbon	Ocean sound
9	Subsurface salinity	Ocean colour	Microbe biomass & diversity
10	Ocean surface heat flux		Benthic invertebrate abundance & distribution

4.3.3. South African Ocean Governance Information and Knowledge Requirements Compared to International Trends

The European Union standards for the assessment of marine environmental status is focused on assessing the impact of pollution and exploitation activities. The standards attempt to describe this impact towards managing marine ecosystems so that their natural functioning and environmental health can be maintained as far as possible.

The Global Ocean Observing System (GOOS) of the United Nations Intergovernmental Oceanographic Commission suggests a list of Essential Ocean Variables. Through interrogating the trends in these variables and their interactions, the GOOS scientists aim to determine the present status and forecast future scenarios of global and regional ocean function. The GOOS has described a strategic mapping that links essential ocean variables to natural phenomena and finally social benefits. It further provides a conceptualization of ocean societal benefits and a method of grouping benefits into three higher order societal benefit themes. Figure 7 is an extract from a larger diagram that shows these GOOS determined linkages between observations or measurements and how these can be linked to the status of societal benefits. The aspects of the diagram that are not included in this extract contain details of various observation programmes, which are not necessary for this discussion. Figure 7 is sourced from the GOOS website description of their Strategic Mapping (UNESCO, 2018a).

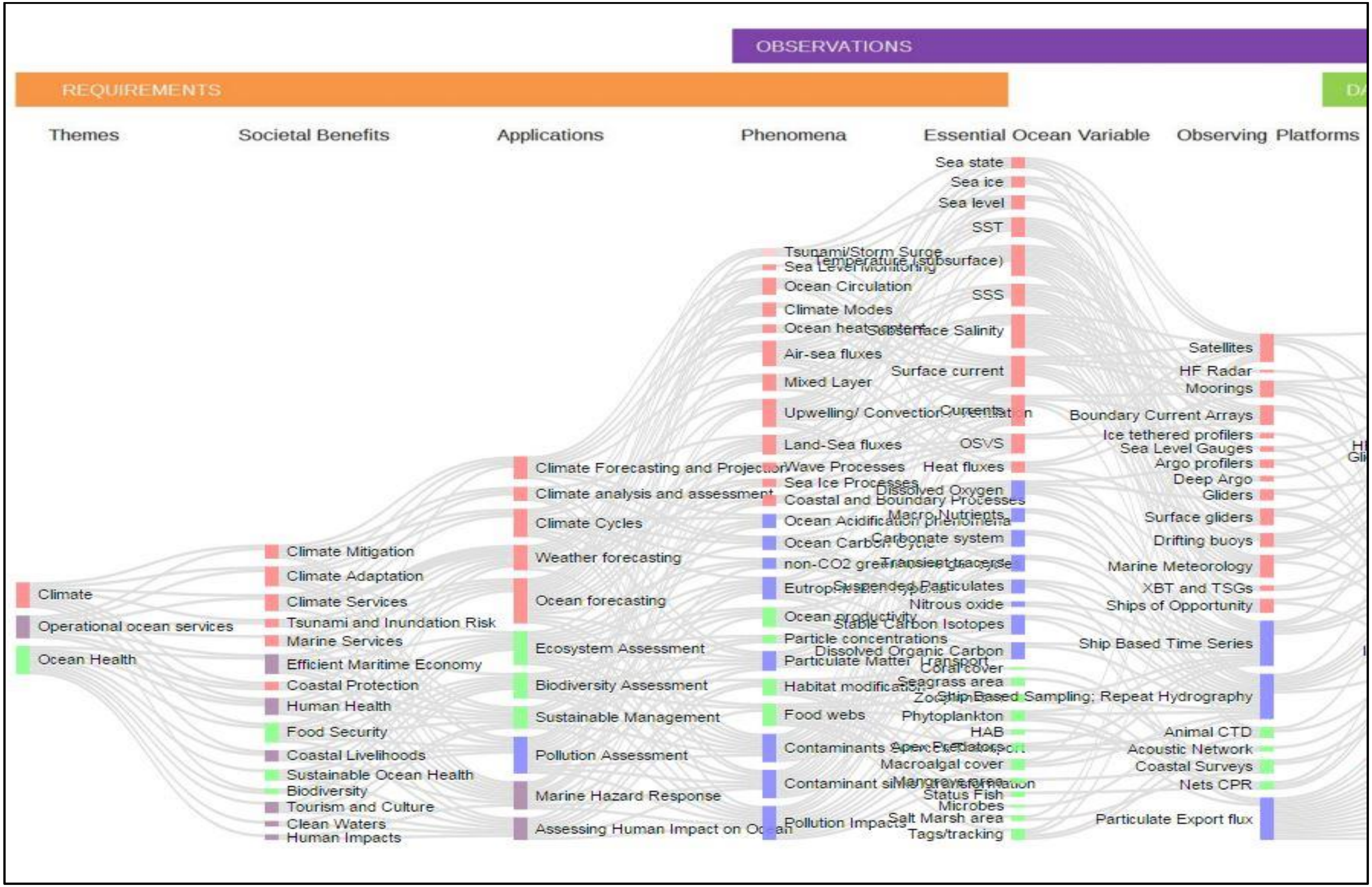

Figure 7.GOOS Mapping showing linkages between Essential Ocean Variables & Societal Benefits (UNESCO, 2018a)

The European Union standards (European Parliament & Council of the European Union, 2008) for assessments of marine waters will fall chiefly in the ocean health aspects of the GOOS mapping. Ocean health aspects could over time be used to track climate and ecosystem function changes. The emphasis on ocean health variables in the EU and GOOS set of variables is similar to that of the information and knowledge requirements identified for the implementation of the NEMO policy in Table 2 above. There is a bias towards natural system assessment and tracking of variability and change.

The NEMO policy, like the EU standards, reflects an underrepresentation of output addressing operational ocean services compared with those assessing ocean health and climate. This is not the key focus of the EU standards that are aimed at assessing human impact and promoting the natural functioning of marine ecosystems.

The South African White Paper on Ocean Governance (NEMO, 2014) does however have sustainable use objectives that will also require a knowledge basis for management. The variables suggested by the EU and the GOOS will not provide information on sustainable use, development of the ocean economy and related technology or information on where the benefits (or costs) of the ocean economy will accrue. A different set of economic and human or societal dataset variables will have to be developed and monitored if South Africa wishes to assess progress on these aspects. These identified societal and economic data sets will have to be added as potential data sets to Figure 6. These will enable a more complete set of knowledge products that support the ocean economy development and track societal beneficiation. Table 2 and Figure 6 also suggest that South Africa will have to develop indicators of ecosystem impact and thresholds at which management interventions will be required, similar to the EU descriptors.

4.4. Current Areas of Public Research Funding

In South Africa marine research and monitoring is primarily funded through eight[5] national departments. These are the Department of Environmental Affairs (DEA), the Department of Science and Technology (DST), the Department of Transport (DOT), the Department of Agriculture Forestry and Fisheries (DAFF), the Department of Mineral Resources (DMR), the Department of Defence comprising the South African National Defence Force (SANDF), the Department of Arts and Culture (DAC) and the Department of Higher Education and Training (DHET). These national departments fund aspects of marine research directly through departmental activities or indirectly through state owned entities. Table 5 summarizes the marine science key performance areas of units within the various national departments. Science units in this table include a range of operational units from Branches of Government Departments, State-owned Entities with Boards of Directors; Universities and Research Programmes. For universities, these key performance areas will include teaching areas at the undergraduate and postgraduate levels. Table 5 is a summary from a full description of the various marine science units or agencies in government. The full text description of these can be found in Appendix 2, and reflect the detail results of investigation of web searchers and planning documents of the various entities. Table 5, and Figures 8 and 9 below, illustrate that while there are several marine or ocean and coasts science nodes in South Africa, generally these nodes have focused areas of operation. These areas of operation align narrowly with their parent National Department. Section 4.4.1 below describes the extent to which the information and knowledge key performance areas identified as necessary to support the White Paper are addressed by the various science centres within government.

[5] The Fisheries function of the DAFF was moved late in 2019 to the DEA through a re-organization of government Departments, reducing this to seven departments. The effective date of this is 1 April 2020. Other departments also underwent name and functional changes in this macro-reorganization process.

Table 5. Description of Marine Science and Knowledge Activity in National Departments and Related Operational Units.

	Department	Unit	Oceans & Coasts Science Products	Highlighted Marine Science Activity
1	DEA	Oceans & Coasts	Data Management Systems Biodiversity Surveys Ecosystem Process Understanding Pollution/Human Impact Assessment National Ocean and Antarctic Research Ship, Base and Infrastructure Support	Marine Land Breeding Top Predator Population Census Rocky Shore Monitoring Programme Ocean physics, chemistry and plankton studies Estuarine and Inshore Biodiversity Surveys
	DEA	SANPARKS	Biodiversity Surveys Pollution/Human Impact Assessment	Biodiversity Surveys of National Parks
	DEA	SANBI	Biodiversity Surveys Biodiversity Mapping Biodiversity Assessment including identifying threatened species and habitats	Collation and drafting of National Biodiversity Assessment (every 5 years) Biodiversity Vulnerability Assessments
	DEA	SAWS	Ocean State Observation and Forecasting Information Communication	Ocean State Forecasting – daily advisories of swell / rough seas / strong winds
2	DAFF	Fisheries Management	Fish Stock Surveys & Assessments	Annual Total Allowable catch and effort estimations for identified fish stocks Development of Operational Management procedures for major fisheries
3	DST	CSIR-Digital Environment-Meraka Institute	Data Management Systems Data Integration & Mapping Systems Information Communications Systems	Marine harmful Algal Bloom and other remote sensing products Development of marine environment decision management tool as components of the National Oceans and Coasts Information Management System
	DST	CSIR-Natural Resources and Environment	Biological and Ecosystem Process Studies Coastal Pollution Assessment	Estuarine survey and assessment Ocean model development
	DST	CSIR-Built Environment	Port Infrastructure modelling laboratory	Science and engineering experiment platform for port and coastal engineering

	Department	Unit	Oceans & Coasts Science Products	Highlighted Marine Science Activity
	DST	Southern Ocean Climate Change Observations	Climate Change Monitoring and Modelling Ocean Observation Technology Development	Ocean chemistry studies, in particular South Ocean carbon-climate studies Development of ocean glider technology and observations
	DST	Applied Centre for Climate and Earth System Science	Climate Change Modelling and Forecasting	Focussed ocean and atmosphere climate studies
	DST	SANSA	Earth & Environmental Observation Maritime (shipping) Monitoring	Processing of several satellite data observations, including more recently Synthetic Aperture radar for tracking ocean features, pollution and shipping.
	DST	NRF-SAEON	Coastal and Ocean Environmental Monitoring and Data Management	Coastal observation platforms and offshore ocean models
	DST	NRF-SAIAB	Freshwater and Coastal (shallow water) biological surveys National Wet Collection for marine and amphibian specimens Aquatic Biodiversity Tissue Bank National Diatom Collection	River, estuary and inshore surveys Coastal and ocean science finding mechanisms linked to available inshore science infrastructure
	DST	NRF-SANAP	Southern Ocean, Prince Edward Islands, Gough Island and Antarctic Base Research Programme excluding ship & infrastructure support	Short term funding for southern ocean, Marion, Gough Island and Antarctic base science programmes primarily from university applicants. Topics covered includes various natural science aspects e.g. seals, seabirds, invertebrates, ecology etc.
4	DMR	CGS	Geological Survey Geological Mapping	Focused marine geology surveys and mapping
5	DOT	SAMSA	Maritime (Shipping) Monitoring	Daily tracking of ship traffic
6	SANDF	SANHO	Ocean Mapping for Navigation	Production of national navigation charts
7	DAC	SAHRA	Cultural & Heritage Site Identification	Mapping of cultural and heritage sites in coastal and ocean ecosystems
8	DHET	Universities	Ecosystem Process Understanding Technology Development Research in Training in Legal Systems Research & Training in Sociology & Archaeology Vocational training for ship crew and officers	UNIZULU - Academic estuary and coastal biodiversity surveys including human impact UKZN

	Department	Unit	Oceans & Coasts Science Products	Highlighted Marine Science Activity
				- Academic estuary and coastal biodiversity surveys including human impact NMMU - Academic estuary and coastal biodiversity surveys including human impact Fort Hare - Academic estuary and coastal biodiversity surveys including human impact WSU - Estuary water quality surveys UCT - Academic estuary and coastal biodiversity surveys including human impact - Academic Coastal Community Social Surveys - Offshore, Southern Ocean oceanography CPUT - Coastal Pollution - Mechanical and electrical engineering projects on coastal natural science observation platforms SUN - Academic coastal biodiversity surveys, including top predators UWC - Academic estuary, coastal biodiversity, offshore (plankton) surveys including human impact - Academic Coastal Community Social Surveys UP - Marine top predator long term studies (including southern ocean – Marion Island)

Note: The Oceanographic Research Institute based in Durban at the Ushaka Seaworld and science competence at the Two Oceans Aquarium in Cape Town and other smaller aquaria in the country were not included in this review, as these initiatives are generally funded wholly or in part from outside of National Government.

4.4.1. Output of Public Research Agencies and their Relevance to NEMO

Figure 8 describes how many of the National Marine Science agencies contribute to each of the knowledge and information requirements of the NEMO White Paper, as identified in Figure 6. Figure 9 describes responsiveness per national marine science unit to the assemblage of knowledge and information key performance area requirements. It demonstrates which of the units have a broad science scope responding to a larger number of performance areas and which may have a narrower focus. Figures 8 and 9 are derived from Table 18 attached as Appendix 3. Table 18 scores each of the science units against the identified information and knowledge key performance areas.

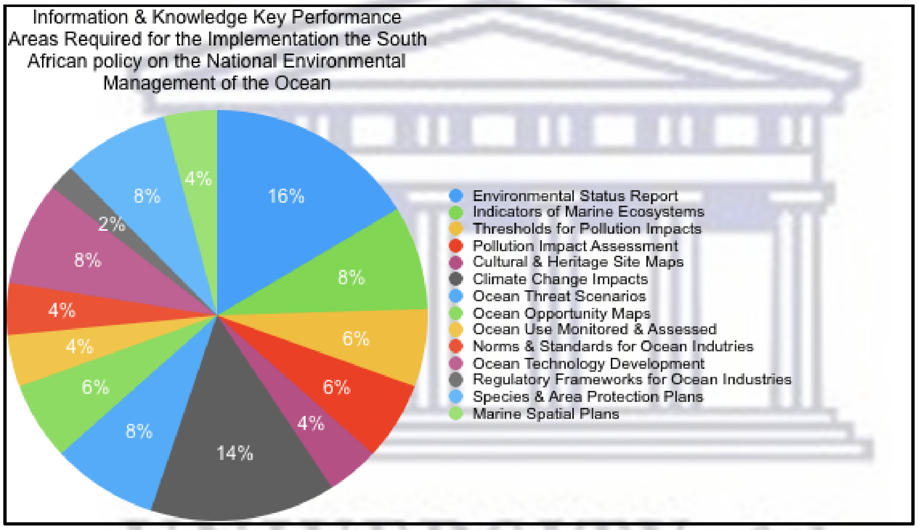

Figure 8. Percentage of National Science Units that respond to each of the Identified Information & Knowledge Key Performance Areas Required for the Implementation of the NEMO Policy.

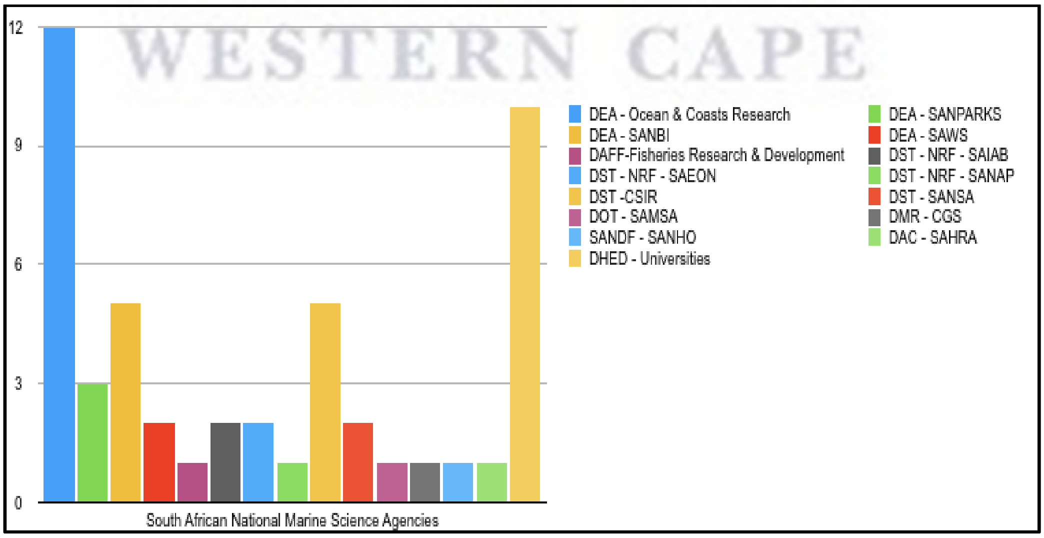

Figure 9. Responsiveness per National Science Unit to the set of Identified Information & Knowledge Key Performance Areas (14) Required by the NEMO Policy.

These summary results in Figure 8 show that output from the various national marine science agencies do not address the knowledge and information requirements of NEMO evenly, with some areas being well represented and others not being represented. Those knowledge and information areas related to biology descriptions and ecosystem natural functioning appear to better represented than the technology and environmental management areas. Knowledge areas that support ocean industrial activity are also not well represented, both from identification of opportunities and resources and also from technology and industry development perspectives. The NEMO Policy wants to actively support the growth of the South African Ocean Economy through the identification of resources and opportunities and through technology innovation. These knowledge areas, like the ocean engineering and technology aspects, are among the least serviced by the publicly funded national South African marine science agencies and represents an area where South Africa will have to grow expertise.

The scoring in Table 18 and the summary in Figure 9 show that most individual marine science agencies tend to focus on selected information and knowledge key performance areas. Exceptions to this are the National Department of Environmental Affairs (DEA) and the National Department of Higher Education and Training (DHET). The DEA is the National Department with the primary mandate for ocean and coasts governance, which resides in the Branch Ocean and Coasts. The science undertaken within this Branch is intended to be foundational to the development and implementation of policy and therefore will cover a broader array of science disciplines. Even within the DEA, the science programmes are directed at the natural and ecosystem functioning areas. The DHET is well represented in terms of disciplines and areas covered as this Department houses all of the universities.

There are also marine science agencies that are very narrow or specialised in their science performance areas such as the Department of Agriculture, Forestry and Fisheries, the Department of Mineral Resources and the Department of Arts and Culture. These agencies have a narrow focus as they are generally support units to specific sectors. This investigation of areas of science did not quantify the output in terms of national or local impact but noted only if the information and knowledge key performance areas was present or absent.

The analysis of performance areas of the various marine science institutions show that there are no identified information and knowledge key performance areas that are not covered by at least one national marine science unit or agency. However, this may not always translate into output or impact at the national level. For instance, there is no standard national assessment of plankton communities or sea state or ocean temperature increase around South Africa, although these parameters are measured by several marine science agencies. At present, no national ocean and coastal indices could be found, except for the National Biodiversity Assessment (NBA) produced by the South African National Biodiversity Institute which is an entity of the DEA. The NBA does not intend to be exhaustive, and comments only on selected aspects of marine and coastal biodiversity, particularly focusing on vulnerability status (Sink et al., 2012; Harris et al., 2019). The DEA also produces an annual State of the Ocean Report, which is a collection of short descriptions of research projects rather a collated national status report on Essential Ocean Variables (DEA, 2018b). The notable exception in the DEA report is the annual reporting of seal and seabird counts, which is placed in the context of longer standardised time series. This has allowed for various interpretations of the populations reactions to environmental pressures (Crawford et al., 2008).

Societal benefits are not mentioned specifically in the objectives of the NEMO policy. As a consequence of this not being emphasised in the NEMO policy, societal benefits are not derived as a required information and knowledge key performance area in this study's interpretation of the supporting knowledge base for the policy. This study undertook to categorize information and knowledge key performance areas from the published Strategic Priorities of the NEMO, hence the exercise did not yield an emphasis on social benefits specifically. Objective Two of the NEMO policy intends to collect information on ocean sectors and does not emphasise social benefits or any other aspect of information that is to be collected. The broadest interpretation of the information and knowledge key performance areas required by the NEMO could then include biodiversity surveys, ecosystem functioning; social and economic resources, benefits and impacts. This would have to be supported by data management and sharing systems.

Beyond the output in the various traditional natural science disciplines, the recent work on ocean science data and information systems by the Department of Environmental Affairs is worth noting as an emerging discipline. South Africa in 2016, launched the National Oceans and Coast Information System (OCIMS, 2018). This System, for the first time, represents a national repository of oceans and coasts information that is intended to be a support tool for government officials, industry and the public who are engaged with marine environments. At present it includes information and knowledge tools on ship tracking, harmful algal bloom detection, coastal hazards, water quality, sea state and marine spatial planning. This is South Africa's first attempt at this scale to making publicly funded ocean and coasts science and observations readily accessible to the public. This System also allows for departments to share information collected within each department. The System has not been officially designated as South Africa's Ocean Atlas as contemplated in Strategic Priority 2.1 of the South African Ocean Policy White Paper or by the MSP Act . This System is a prime candidate to serve as this Ocean Atlas and addresses objectives two and three of the NEMO policy in that it provides a platform for collation and sharing of ocean sector use and planning information. The System is still in development and while the ship tracking and the harmful algal identification and forecasting tools are operational, national indices such as knowledge products on sea state or roughness, or collated data on sea temperature or biological parameters are still to be created. The System does have at present an application created for marine spatial planning where various sector use layers can be viewed. This supports the systems candidacy for being designated as the marine spatial planning information system as contemplated by the MSP Act.

4.5. Discussion: Does Existing Public Funded Research Generate the Information Base to Implement NEMO?

The South African Policy on the National Environmental Management of the Ocean - NEMO (NEMO, 2014) has objectives of:

1. Coordinating and supporting the implementation of the relevant existing statutory and institutional frameworks
2. Establishing mechanisms for sectoral data collection and sharing
3. Creating and maintaining a shared national knowledge base on the human activities, status and functioning of the ocean
4. Establishing integrated ocean sustainable development and conservation ocean plans by the undertaking of strategic environmental impact assessments and the use of spatial planning tools
5. Enhancing national human and technical capacity to better understand and utilise ocean resources and opportunities; and
6. Pursuing regional and international cooperation and governance mechanisms (Ibid., Section 5b, p. 10).

These objectives require an information and knowledge platform for policy implementation, including observations of impacts of management interventions. This platform has been disaggregated in this study into several Information and Knowledge Key Performance Areas. The output from national marine science units or agencies was then assessed to establish the extent to which they respond to the NEMO policy requirements.

There appears to be at least some national science activity in each of the identified information and knowledge key performance areas, although activity is not evenly distributed across the areas. The ocean health areas dominate the science programmes of the national marine science agencies. Technology development and industrial support for ocean industries enjoy less attention across the marine science agencies. Industrial support, including the identification of potential resources and engineering technology development to improve access to ocean resources are represented much less than the biological and environmental assessment science disciplines. Science around norms and standards for ocean industries, as well as thresholds for impacts and the development of status indicators, are also not well represented across the marine science agencies in South Africa.

This conclusion is similar to observations made by the United Nations Intergovernmental Oceanographic Commission in its Global Ocean Science Report (UNESCO, 2017). This report categorized science output in terms of publications into 8 areas: Blue Growth, Marine Ecosystems Functions and Processes; Ocean Crust and Marine Geohazards; Ocean Health; Ocean Observation and Marine Data; Ocean Technology and Engineering; and Human Health and Well-Being. In this categorization the report concluded that South Africa has a balanced spread of publications across these eight areas but with slightly higher values in ecosystem functioning and processes. This report found that Africa as a continent produced more ocean related science publications that focused on human health and well-being, while globally marine ecosystems and ocean and climate studies dominated, with Asia also showing a focus on ocean technology and engineering. This present study's finding of South Africa's bias towards ecosystem studies does then follow the global trends of a bias towards ecosystem functioning with publications in engineering and technology disciplines lacking. Globally publications in engineering and technology may be reduced in the publicly available arena as these sciences are often funded by private companies who guard their intellectual property across business, engineering and technology intelligence (Linton, 2016). South Africa does not have any privately owned offshore exploration and exploitation mining companies, except for the diamond mining and one relatively low volume production gas site as described in Chapter Six. These activities in South Africa's ocean territory occur relatively inshore. South Africa is therefore unlikely to have major nationally based ocean engineering and technology capacity.

The NEMO policy's major contribution to ocean governance is the concept of marine spatial planning. Marine spatial planning as an area of science activity is identified in only two science agencies. There is scope for applied research in support of marine spatial planning processes, even though these processes must be led and implemented by government, namely the Department of Environmental Affairs, as identified in the Ocean Policy White Paper (NEMO, 2014). Rassweiler, Costello, Hilborn and Siegel demonstrate advantages of incorporating scientific guidance into marine spatial plans (Rassweiler et al., 2014). Other studies also argue that science and data collection on environmental and social observations can enhance the marine spatial planning processes (Halpern et al., 2012a; Clarke et al., 2013; Arkema et al., 2015). In addition to including basic environmental functioning and survey data, there is growing recognition of the need to promote the use of data derived from communities and society into marine spatial planning (Rodwell et al., 2014; Colenbrander & Sowman, 2015). Increasingly local coastal conservation strategies are including socioeconomic data and considerations (Halpern et al., 2013; Mangubhai et al., 2015). There is scope for the existing South African marine science agencies to develop science in support of marine spatial planning. These science aspects are now including the development of social-ecology studies to investigate the inter-relationships between social dynamics and marine ecosystem and resource functioning (Lade et al., 2015).

Engineering and technology sciences that support ocean industries will also be an area that will need development in South Africa both at university education programmes and applied centres of technology advancement. This is a requirement if South Africa is to generate ocean industries within the country. Engineering and technology advancements are interlinked with increasing ocean discovery and use (Wenhai et al., 2019).

The value of ocean and coastal science must be in its relevance to society, as the South African Constitution stipulates the outcome of environmental management must be that it benefits society. In their discussion of biological essential ecosystem variables Miloslavich and co-workers make strong and direct linkages to social relevance (Miloslavich et al., 2018). The linkages can be applied to all ocean science and observations beyond biological essential ocean variables. Importantly, the authors note that essential ocean variables (EOVs) may have different levels of significance ranging from local to national and regional and global. Even within the same EOV, sampling resolution and length of the time series over which a variable was observed, may offer different insights into processes and forecasting ability of marine ecosystems.

South Africa is a developing nation with an extremely high unemployment rate and a low economic growth forecast and as such must prioritize its economic development. The sustainable development objective of the NEMO policy is very relevant and valid, and must be supported by the science and monitoring of EOVs to understand processes and forecast ocean conditions and options for marine resource use and economic return. The economic development imperatives are evident in the various government strategies outlined in Section 3.6 above. South Africa also, in this sense, has the responsibility to gather resource potential and ecosystem functioning information on the large ocean area in the south Indian, south Atlantic and Southern Ocean to Antarctica. This is in its own interest and in the global interest of understanding and forecasting earth system dynamics. In their analysis of challenges to implementing ecosystem-based approaches to MSP in South Africa, Lombard and team identify the lack of basic environmental data; climate change impacts; slow implementation and lack of legal instruments to support ecosystem approach to fisheries; management of conflicts in marine tourism industries and the need for systems approach to integrated ocean management (Lombard et al., 2019b). Their study does support the collection of EOV type measurements, and notes the use of social sciences as an approach to resolving conflict. The Lombard review also identifies the need for investment in social science in support of ocean governance and MSP as a challenge.

Does the existing publicly funded research generate the information base to implement the NEMO policy in South Africa? There is ocean and coastal science capacity that exists in South Africa, however it has to be grown and coordinated so that it produces outputs that can be used at the national level for policy planning and implementation, including the development of marine spatial plans.

Information collected within research projects and programmes must be scalable so that they can be used to manage at the ecosystem level, or at the national level. The concept of scalability is described by Miloslavich et al. (2018), as a function of spatial and temporal resolution of observations combined with how many agencies or research programmes undertake such observations. This would suggest that for South Africa, those marine science agencies that overlap in expertise and applications, should cooperate to make their research efforts scalable by standardizing on methods to produce information and knowledge that can have broader relevance and national impact.

The NEMO policy does show similarities to international information and knowledge key performance area trends identified in the European Union (EU) and those suggested by the United Nations Global Ocean Observing System (GOOS). At a local level the NEMO policy objectives aim to safeguard against damaging the ocean and coastal environment as a result of various forms of direct and indirect human impact. These are very much the objectives of the EU Directive (European Parliament & Council of the European Union, 2008). At ecosystem or regional scales, the NEMO policy aims to understand and forecast the ocean processes so that impact on threats and opportunities can be assessed and factored into management interventions. This concept of understanding and forecasting processes is similar to objectives of the United Nations GOOS (UNESCO, 2018a).

Research output on the societal benefits of the oceans and coast information is an area that will also require investment to develop national capacity. While the ocean economy knowledge areas were defined as the identification of economic opportunities and resources by the NEMO policy, the societal benefits are not articulated specifically in the Priority Statements. Societal benefits, including economic benefits to the country such as tax revenue, job creation and the improvement of coastal business and community livelihoods and living standards must be included in marine spatial planning considerations, when evaluating trade-offs and balancing criteria for ocean and coastal use (Frazão Santos et al., 2018). Societal considerations are increasingly being required in ecosystem-based approaches to marine environmental management (Alexander et al., 2018; Shabtay et al., 2018a). South Africa, like other coastal states, will need to invest in creating a set of technical science skills towards building social science and also invest in capacity in integrating natural, economic and social sciences.

The United Nations Global Observing System has evolved over recent years to move from purely physical Essential Ocean Variables like temperature to chemical variables such as nutrients, and most recently to include biological variables such as plankton and top predators. The next iteration could consider social and economic Essential Ocean Variables such as human well-being criteria, jobs potential, coastal food security, disease outbreak and disaster readiness.

South Africa does require a more coordinated approach to maximise the output and impact from the current marine science investment with regards to supporting the implementation of the NEMO policy. This plan must include future investment in equipment, laboratory facilities, ships, data systems, identification of new data streams and observations to include social and economic dimensions. The plan must foundationally include cohorts of people capacity across these disciplines. Other countries such as the United States of America and the United Kingdom have recognised this challenge and have already set in motion long term development plans (Glickson et al., 2011; Bryden et al., 2012). The future investment planning must include coordination to optimise desired returns at the environmental management interface.

South Africa will have to make a conscious decision to grow the areas of science capacity that it requires. A nationally coordinated plan to optimise planning efficiencies around Essential Ocean variables across natural, economic and social sciences is required. The plan will have to identify institutions that can host these capacity areas. Universities will have to be involved, as often National Departments are restricted to invest their funds and resources within their narrow management mandates. Working within their mandates, and funding only the science that is directly associated with these, has probably led to sub-optimal capacities and outputs in cross-disciplinary science programmes. The Department of Science and Technology (DST) does fund the majority of science disciplines in the country. Through the National Research Foundation, the DST identifies areas of excellence and rewards these researchers through competitive grant programmes. An unintended consequence of this is that only established research areas are funded – where expertise exists[6]. In order to grow new capacities of economic and social science as it relates to marine ecosystems, or to drive technology innovation in ocean industries, a new funding model must be set up for these areas that are unlikely to have existing expert capacities and competencies. This could take the form a specific development research programme co-funded by departments involved in growing the ocean economy.

A possible vehicle for this could be the use the DST's Research Chair Initiative. This Initiative funds the appointment of Research Chairs at Universities for periods of five year (renewable) periods. The concepts revolves around the Research Chairs being experts in their field and can therefore grow fledgling disciplines around them. The Research Chairs can be employed from outside South Africa, allowing for expertise to be brought into the country. Research programmes in ocean resource economics; marine ecosystem goods and services beneficiation; community and stakeholder engagement models in MSP; ocean engineering and industry technologies; and establishing and piloting a comprehensive and transdisciplinary set of EOVs for South Africa could be potential Research Chair Programmes. The specified science output of such interventions must be actionable management recommendations that relate to the context of the working realities of the various departments involved in the ocean sectors.

In a directly phrased title question of "Science in the service of society: Is South Africa's marine and coastal science addressing South Africa's needs?" Cochrane et al., (2019) contemplate that South Africa's research priorities are not aligned with management and societal needs. Their assessment focused on the abstracts of South

[6] The DST's National Research Foundation Calls for Proposals and eligibility criteria can be viewed at https://www.nrf.ac.za/funding/framework-documents/funding-framework-documents, accessed 31 March 2020.

Africa’s premier Marine Science Symposium held in 2017. Although the symposium theme included economic and social resilience, they found that the majority of the conference papers focused on natural science with only a fifth (21%) of the papers relating to societal needs, with fewer submissions deemed to be interdisciplinary or including both natural and human sciences. These observations of natural system science bias reflect the findings of the present study of South African ocean and coasts research units or agencies. The Cochrane et al., assessment recommends that there must be a conscious and concerted effort by science managers and sector departments to grow interdisciplinary science programmes. This recommendation is made notwithstanding the strained history between the natural (often reductionist) and human or social sciences. The authors conclude that Interdisciplinary Programmes are more likely to produce relevant and actionable outcomes, as these are possibly more cognizant of the complex real world interdependencies. There is strong agreement with this sentiment study and the concept of interdisciplinary science is further discussed in Chapter Eight.

Science capacity investment and development, even with strong ambition for actionable outcomes, must still take into account the working conditions and governance context of implementing departments. This is one of the ideas that was raised in the interviews with government officials, and is further discussed as part of the governance context in South Africa in Chapter Seven. When science programmes are framed to have actionable outcomes at the outset, with outcomes constructed on rigorous science, and are considerate of their delivery mechanism (government implementation), then the science outcomes are likely to be impactful.

5. The Role of Regional Programmes in National Ecosystem-Based Marine Management – South Africa and the Benguela Current Commission

5.1. Introduction

The South African White Paper for the National Environmental Management of the Oceans (NEMO) proposes an ecosystem-based approach to marine environmental management. The Ecosystem Approach to ocean management is articulated together with the earth system approach as a guiding principle for ocean management (NEMO, 2014). The Ecosystem Approach has over the last two decades gained wide attention (Arkema et al., 2006; Sherman, 2014b) and has emerged as the environmental governance standard to which coastal countries have striven to meet (Link & Browman, 2017; Tam et al., 2017).

Ecosystem-Based Management (EBM) or the ecosystem approach to environmental management is the methodology of ecosystem management that attempts to incorporate and give consideration to all the biological and ecological components of an ecosystem and their direct and indirect relationships (Blanchard et al., 2010; Shin et al., 2010b, 2010a; Karsenti et al., 2011; Link & Browman, 2017).

Human communities and societal-ecosystem interactions are now increasingly being motivated for inclusion in EBM. The previous Chapter, Chapter Four, concluded that social benefits and societal imperatives and drivers must be included in ocean management. This, in keeping with recent work, has made the argument that ecosystem-based management must include societal aspirations (Lade et al., 2015; Österblom et al., 2017; Alexander et al., 2018; Soma et al., 2018). Current and future marine ecosystem management frameworks must increasingly be seen to include societal considerations and outcomes. Human use, management of and impact on marine resources, goods and services occur at scales that influence the character, behaviour and functioning of ecosystems. Fishing for instance has been a significant and permanent impact, over the last century, on marine ecosystems. It has systematically altered marine ecosystems. Existing and new impacts of humans on marine ecosystems will continue to collectively change these systems and the goods and services they offer (Halpern et al., 2012b; Samhouri et al., 2012; Halpern et al., 2019).

Ecosystems are a human concept of thinking about associations in nature, and therefore can be described at many different size scales, from local shore lines to ocean basins. The Large Marine Ecosystems concept is a functional conceptualization that is used by several global organisations such as the Global Environmental facility (GEF) and the United Nations Environment Programme. Sixty six Large Marine Ecosystems have been defined and generally cover all the oceans adjacent to continents. The Large Marine Ecosystem, as a functional management unit was developed and proposed by Sherman as a research and management strategy for living marine resources (Sherman, 1991).

Building from Ecosystem-Based Management, the Earth System Approach to ocean management makes the link that the oceans are a major feature, if not a dominant feature of the earth surface and therefore understanding of the Earth System processes must include ocean interactions (Chandrakumar & McLaren, 2018). These interactions comprise ocean-ocean, ocean-land, ocean-atmosphere and ocean-people interconnections.

As the ability, through technology, to monitor and survey oceans has increased, ocean-earth system interactions have been investigated across biological, physical and chemical disciplines. These studies have now developed, with easier access to more powerful computing, to analyse big data sets covering large areas of the planet and long-time series. Research programmes and computer models have evolved to be more complex and promote the large-scale observations over time and space in efforts to understand global natural processes, and contextualise process variability and ecosystem change (Karsenti et al., 2011; Rodgers et al, 2015).

Ecosystem-wide and planetary studies are now expected to provide insights into how human impact will affect natural processes and also how these changes will in turn impact the environmental, including ocean, goods and services that human beings rely on (Bonan & Doney, 2018). While the science capability exists to appreciate the processes, impacts and changes of large areas of the ocean at the ecosystem level, the ability to act on the results and recommendations of these ecosystem level studies is dependent on the governance frameworks. There must be governance structures that can implement, or at least guide or recommend implementation of management interventions at the eco-system level (Langlet & Rayfuse, 2019). For marine ecosystem-based governance, this will generally involve work across country's political borders as large marine ecosystems are shared across borders. The Large Marine Ecosystem concept of categorizing ocean spaces dictates and allows for countries to cooperate across political boundaries.

While the Ecosystem-Based Management approach was articulated as a concept in the 2014 gazetting of the NEMO policy; it has been an objective that South Africa has pursued over recent decades, specifically with regards to the Benguela Current Large Marine Ecosystem (Cochrane et al., 2004; Moloney et al., 2004). South Africa has actively engaged with Namibia and Angola over the last four decades in studying the Benguela Current Large Marine Ecosystem through various programmes aimed at understanding the natural functioning of the system. These programmes gradually progressed from fisheries specific surveys for fisheries stock assessment cooperation to ecosystem approaches to fisheries management and more recently to an ecosystem-based approach to ocean management as a stated objective of the Benguela Current Commission (Hamukuaya et al., 2016; Neto et al., 2016). Notably South Africa is also committed to the Ecosystem-Based Approach to environmental management through its full participation in the Convention on Biological Diversity and the Sustainable Development Goals as discussed in Chapter Three above.

The objective of this Angola-Namibia-South Africa collaboration has been the improved management cooperation for the Benguela Ecosystem (Cochrane et al., 2009; Cossio et al., 2012). The successful negotiation of the Benguela Current Convention is marked as a major milestone towards regional ocean management (BCC, 2013). While the Benguela Current Commission (BCC) has been established only recently in 2015, after the three countries ratified the Convention nationally, there is a much longer history to the organization in its early forms as a Large Marine Ecosystem Programme with funding support from the Global Environment Facility, and additional financial contributions by Norway and Germany (BCC, 2018).

The contribution that the Benguela Current regional programmes made to South Africa's implementation of the ecosystem-based management approach is assessed in this Chapter through evaluating and assessing the objectives of the Benguela Current Commission and the outcomes of the major projects that it has implemented since its inception. The Chapter then concludes on the extent to which the BCC contributes to the South African implementation of the ecosystem or earth system approach to marine management, which is an aspiration of the White Paper on the National Environmental Management of the Ocean.

The discussion of the BCC notes that this Convention is a primary marine regional governance institution of the three party states and focuses on the Benguela Ecosystem. The Abidjan and the Nairobi Conventions represent broader, more inclusive marine governance convention agreements active on the west and east coasts of Africa respectively.

5.2. Research Methods

Principles of the Convention and the NEMO policy were compared to establish and assess their reflection of the ecosystem-based management and earth system approaches. The Benguela Current Commission, its governing Convention and institutional arrangements were described and assessed for their potential to facilitate ecosystem-based management in the Benguela Current Large Marine Ecosystem. The Strategic Action Plan of the BCC and recent project documents and products were then analysed to determine the extent to which these have supported the implementation of ecosystem-based management (EBM).

The Benguela Current Commission project documents analysed in this assessment included the Marine Spatial Management and Governance Programme (MARISMA); the Enhancing Climate Change Resilience in the Benguela Current Fisheries System Project; the Improving Ocean Governance in the Benguela Large Marine Ecosystem (BCLME III) Project; the Development of Ecological Sustainable Fisheries Practices in the Benguela Current Large Marine Ecosystem (ECOFISH) Project and the BCC – Norwegian Science Plan. The project documents for these projects were accessed from the BCC website (BCC, 2018). Prior to 2008 three major projects were undertaken: The First and Second Benguela Current Large Marine Ecosystem Projects (BCLME I & II) and the Benguela Environment Fisheries Interaction and Training (BENEFIT) Programmes. These were characterized as research programmes and provided and collated much of foundational knowledge and motivation for the creation of the Commission. These programmes are not included for detailed analysis in this study.

The primary document assessed was the current Strategic Action Plan (SAP) of the BCC which was intended to be implemented from 2015 to 2019 (BCC, 2014). The SAP was assessed in terms of the Action Responses it proposed and how these relate to EBM. These proposed actions were then assessed to categorize the extent to which the BCC achieved these to date. The extent to which the Action Responses were achieved over the 2015 to 2019 period are assessed by reviewing published project outcomes, reports archived on the BCC website and minutes of the Commission meetings. Additional insights were gained through interviews with key informants. The key informant process was described in Chapter Two and elaborated on in Chapter Seven.

5.3. The Benguela Current Convention Treaty

The Benguela Current Convention describes the objectives of the collaboration, institutional structures of the Convention, the Benguela Current Large Marine Ecosystem, roles and responsibilities of the parties and the jurisdiction of the Benguela Current Convention (BCC, 2013). The Benguela Current Large Marine

Ecosystem is described as the "ecosystem associated with the Benguela Current and characterised by distinct bathymetry, hydrography, productivity and trophically dependent populations" (Ibid., 4). The area of application of the Convention is described as the area from the high-water mark to the extent of the areas within national sovereignty and jurisdiction as described by the United Nations Law of the Sea for the three countries that are Party to this Convention: Angola; Namibia and South Africa. This will include all territorial waters, and areas claimed as Exclusive Economic Zones and potential areas claimed through the extended continental shelf processes. The definition of the Benguela Large Marine Ecosystem offered by the Convention will include all of the ocean jurisdiction of Namibia, but is interpreted on the BCC website as not including all of the ocean jurisdiction of Angola and South Africa, extending to Cabinda Province in Angola and east of Cape of Good Hope in South Africa (BCC, 2018).

The Convention itself was signed in 2013 and came into force in 2015, after the three countries completed their National ratification processes and deposited the signed Convention. This established the Commission. The formal Commission phase was preceded by an Interim Commission which was a temporary working arrangement that was established by Namibia and South Africa signing the Interim Agreement in August 2006, with Angola following in January 2007 (BCC, 2018). The final text of the Benguela Current Convention was negotiated just prior to the 2013 signing, which in the case of South Africa, would have realised an overlap in the years that the Green and White Papers on Ocean Governance were being drafted and finalised (NEMO, 2012, 2014).

The Convention text sets out Articles that define its Objective, Principles, Organisational Structure, and Functions of the various sub-structures created through the Convention, in addition to various corporate governance rules.

The Objective of the Convention is captured in its Article 2:

"promote a coordinated regional approach to the long-term conservation, protection, rehabilitation, enhancement and sustainable use of the Benguela Current Large Marine Ecosystem, to provide economic, environmental and social benefits." (BCC, 2013, p. 5).

Although concisely stated, this objective does have much resonance with the six Objectives of the South African White Paper on the National Environmental Management of the Ocean – NEMO (NEMO, 2014), in that it emphasizes coordination and articulates the need for outcomes across the social, economic and environmental dimensions. In particular, objective six of the NEMO policy states the need for “pursuing regional and international cooperation and governance structures” (Ibid., 10) and is therefore a strong policy enabler for regional cooperation. Additionally, Strategic Priority 4.1 of the NEMO policy devotes four of its six Priority Statements to regional and international cooperation.

5.3.1. The Ecosystem-Based Management Principles of the BCC and NEMO

The Benguela Current Convention (BCC, 2013), sets out General Principles in Article 4 and the NEMO policy sets outs a series of Ocean Governance Guiding Principles in Section 5 of the Policy (NEMO, 2014).

Table 6 lists the Principles of the Benguela Current Convention (BCC, 2013) and South African White Paper on the National Environmental Management of the Ocean – NEMO (NEMO, 2014). References to Ecosystem-Based Management or Earth System Approaches are highlighted.

Table 6. Policy Principles of the BCC and South Africa's White Paper

Policy Principles		
	Benguela Current Commission	**South Africa – NEMO Policy**
1	Cooperation, collaboration and sovereign equality Principle	Sustainable use and management of ocean resources and ecosystem services in order to benefit present and future generations
2	Sustainable use and management of the marine resources	Protection of biodiversity in the ocean environment and the conservation of marine ecosystems
3	Precautionary principle	Application of the precautionary approach to sustainable use and conservation
4	Prevention, avoidance and mitigation of pollution	Prevention, avoidance and mitigation of pollution and adherence to the polluter pays principle
5	Polluter pays principle	Strengthening of human capacity to deal with a changing environment, including the impacts of climate change such as increases in sea-surface temperature, sea-level rise and ocean acidification
6	Protection of biodiversity in the marine environment and conservation of the marine ecosystem	Identification of economic opportunities which contribute to the development needs of the poor and vulnerable within the population ensuring human dignity
7		Promotion of collaboration and cooperative governance
8		Promotion of an ecosystem and earth system approach to ocean management

A comparison of the Principles across the BCC and the NEMO policy makes for similar reading regarding several aspects, including approaches to sustainable use, precautionary approach, collaboration, pollution prevention and management and the polluter pays principle. The Ecosystem-Based Management approach (EBM) is articulated in the Principle 6 of the BCC and in Principles 1, 2 and 8 of the NEMO policy. The NEMO policy further elaborates on EBM with reference to the use and management of Ecosystem Services, Ecosystem Conservation and specifically mentions the Ecosystems and Earth Systems Approach to Ocean Management. The BCC Principles are not as expansive regarding EBM, only referring to the term Ecosystem in relation to Conservation of the Marine Ecosystem. The Convention text however does have an expansive, all-inclusive, definition of the term Ecosystem and includes within this a defined use of the term Environment. Ecosystem is formally defined in the Convention as: "Ecosystem means a dynamic system of plant, animal and micro-organisms communities and their non-living environment interacting as a functional unit" (BCC, 2013, p. 5). The Convention then describes Environment as: "Environment includes, but is not limited to, the whole or any component of (a) nature, which includes air, water (including the sea, and the sea bed), land (including soils and minerals), energy and living organisms other than humans; (b) the interaction between the components of nature and between those components and humans; and (c) physical, aesthetic and cultural qualities or conditions that affect the health and well-being of humans" (BCC, 2013, p. 5). These definitions are fully inclusive of all aspects of ecosystems but do not include humans as part of the ecosystem or environment, although the environment definition does include interactions with humans and impacts that affect humans.

In addition to the formal definitions contained within the Convention, the BCC intention to incorporate the ecosystem considerations and the EBM is evidenced in its structure. The Convention sets out the permanent structure of the BCC and outlines functions for each of these. The Organisational Structure of the BCC as set out by the Convention is described in Figure 10, and includes six sub-structures.

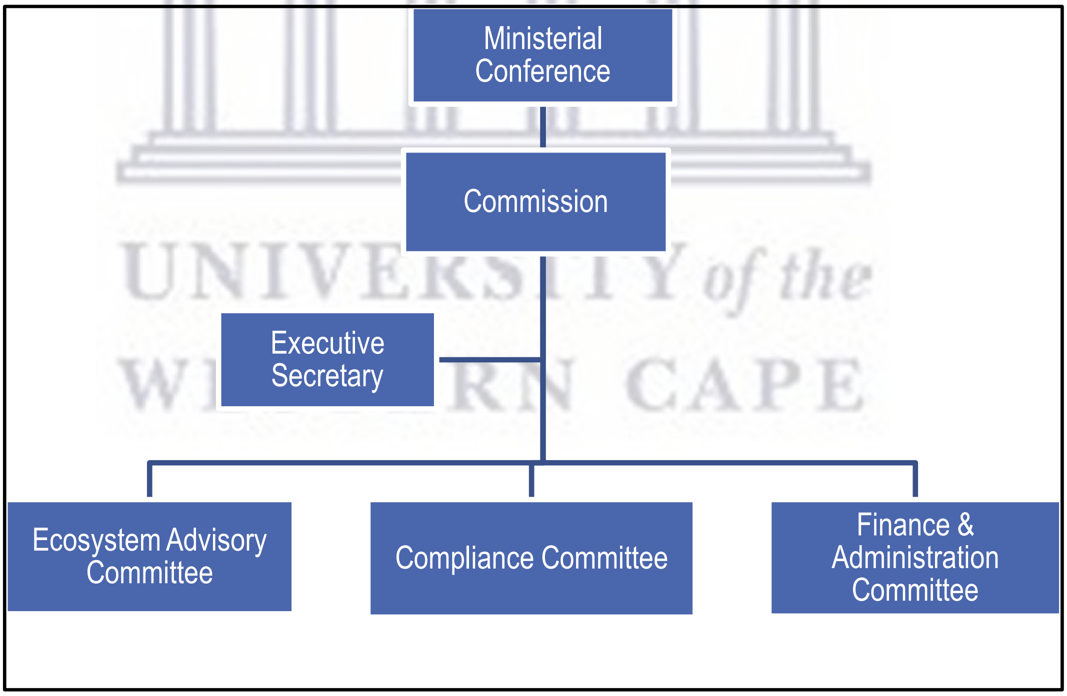

Figure 10. Organisational Structure of the Benguela Current Commission (from Hamukuaya et al. 2016)

The Ministerial Conference is the highest decision-making component of the Convention, and it is expected to meet every two years. This Conference approves the strategic direction and programmes of the Commission and also approves budgets and workplans. Like all structures of the Convention, this Conference is chaired on a rotational basis by each of the Party States. Government Ministers are the expected participants in the Conference.

The Commission provides strategic direction in the implementation of the work plans and budget. The Convention tasks the Commission to agree on transboundary actions that may be required to meet the objectives of the BCC such as pollution mitigation interventions or conservation and management measures, including any sharing arrangements for fishery resources. Commission level representation to date has been at senior government official from Director and above.

The Secretariat, headed by the Executive Secretary, is the operational unit of the Commission, and seeks to implement the strategic and business plans and budget formulated and adopted by the Commission and the Inter-Ministerial Conference. The Secretariat also has the key function of sourcing additional funding which is used to fund the programmes approved by the Commission. Each State Party is expected to pay an annual contribution to the Commission. The annual contribution amount is approved by the Commission, and is primarily used towards the funding of the Secretariat operations and core staff.

The Finance and Administration Committee serves to develop financial management policy and provides an assessment of the Secretariat's implementation of such policies, including reviewed audited reports. This Committee also works with the Secretariat to develop and recommend annual budgets to the Commission.

The Compliance Committee collates information and makes recommendations to the Commission on compliance measures, specifically towards coordinating these across the three Parties States. This Committee also seeks to coordinate such activities with the other Committees of the Commission. The Compliance Committee will be a key functional unit if the Commission were to implement any regional compliance or reporting programmes.

The Ecosystem Advisory Committee (EAC) has two major functions. The first is to establish and manage a science programme. Thereafter based on science and information, the EAC must develop and recommend conservation and management measures to the Commission. The EAC functions as the primary structure of the Convention to develop EBM considerations and recommendations.

The establishment of the EAC and the Compliance Committee as permanent features within the Convention structure signals the intention of the Convention to implement ecosystem-based management. These Committees are intended to provide the Commission ecosystem-wide, transboundary assessments and interventions. Key to the success of the Commission in achieving its EBM objectives will be the formulation and implementation of coordinated and coherent policy and management interventions across the three countries. The Commission and the Ministerial Committee are also key governance structures that will allow for the approval and adoption of decisions on the management of the Benguela Current Large Marine Ecosystem. It is important to note that while the Commission may formulate and even approve these transboundary interventions, governments of the three-party countries must still implement these at the national level. This in reality would mean that the relevant Ministers and Departments within each country will have to implement decisions of the Commission. Angola, Namibia and South Africa are represented by the Minister of Petroleum Resources, Minister of Fisheries and Minister of Environment respectively, as lead Ministers at the Ministerial Conference. Similarly, these Departments are represented in the Commission, with Commissioners being appointed from these three Departments. There is an expectation that country level stakeholder meetings are undertaken by lead Departments where country positions are discussed and agreed upon before these are taken to Commission and Ministerial meetings.

5.3.2. The Major Projects of the BCC and How Their Knowledge Products Support Ecosystem-Based Management

Over the last decade the BCC and its predecessor, the Interim Commission, developed a Strategic Action Plan (SAP) and actively sought funding for major projects that would realise the actions identified in the SAP. These projects aimed to address the Ecosystem-Based Management (EBM) in various ways and included the Marine Spatial Management and Governance Programme (MARISMA); the Enhancing Climate Change Resilience in the Benguela Current Fisheries System Project; the Improving Ocean Governance in the Benguela Large Marine Ecosystem (BCLME III) Project; the Development of Ecological Sustainable Fisheries Practices in the Benguela Current Large Marine Ecosystem (ECOFISH) Project and the BCC – Norwegian Science Plan.

5.3.2.1. The Strategic Action Plan of the BCC - 2015 to 2019

The BCLME Strategic Action Plan Implementation Project was funded as a Global Environment Facility project. The project was implemented from 2010 and supported the negotiation of the BCC Convention text. This project also produced the Strategic Action Plan and Science Plan in 2013, facilitated the creation of the Finance and Administration Committee, and the working arrangements of the Interim Benguela Current Commission (Global Environment Facility, 2010). A major objective of this project, which had the formal title of – Implementation of the Benguela Current LME Strategic Action Programme for Restoring Depleted Fisheries and Reducing Coastal Degradation, was to support the establishment of the Benguela Current Commission. The Commission was viewed as the primary governance vehicle through which to improve the management of fish stocks and coastal management. The Project also had the objective of defining Water Quality Indicators to describe the status and assess effectiveness of management interventions. In addition to the specific objective of halting the decline of fisheries in the BCLME, the project aimed to grow "effective conservation and management measures to mitigate degradation of the ecosystem as a whole" (Ibid., 1).

The present version of the Strategic Action Plan (SAP) is based on a Transdiagnostic Analysis (TDA) that was revised and updated from a much earlier version produced in 1999. The exercise in 1999 also produced a SAP, and this 2013 version of the SAP was intended to revise that earlier work (BCC, 2018). The TDA is an exercise that documents the challenges and categorises issues and impacts including environmental and social aspects. The TDA exercise is standard practice in the Regional Seas Programmes of the United Nations (Duda, 2019). This drafting of the SAP was concluded and signed by the three countries in 2014 and covered the five years between 2015 and 2019. Its implementation over the five years is intended to respond to the issues raised in the TDA.

The SAP describes Challenges in the BCLME in seven categories and then proposes Strategic Solutions to these in eight categories, with Governance of the BCLME being raised as the additional eighth overarching area that is not specifically raised in response to a specific challenge category (BCC, 2014). The seven challenge areas of this SAP are summarized here as:

i. Non-optimal sustainable use of marine living resources, including aquaculture
ii. Non-optimal use of non-living marine resources, including a lack of knowledge of resource potential and governance arrangements
iii. Productivity and environmental variability, described through the lack of understanding of how climate change will impact the variability and productivity of the Benguela System and the occurrence of extreme events such as major algal blooms
iv. Pollution that includes a wide range of contributors from water quality to oil spills, marine litter, noise and greenhouse gas emissions
v. Ecosystem health and biodiversity issues relating to knowledge production to support the identification of novel economic opportunities such as the development of pharmaceuticals from marine organisms. This challenge also raises the issue of insufficient knowledge on which to develop management responses to threats to biodiversity from over-exploitation, including the cumulative impacts from across industry sectors. Insufficient knowledge also extends to the identification of indicator species to assess the health of the Benguela ecosystem
vi. The human dimension challenge recognises the interdependencies across the social, economic, political and ecological systems, but observes that there are insufficient data, processes and knowledge to link these domains to contribute

to regional decision making. The human dimensions considerations also include practical aspects of regional disaster planning, safety at sea and conflict management

vii. The challenge to enhance the economic potential of the BCLME is specified in four areas: marine transport; oil and gas development and production; mining; and aquaculture. It is presumed that fishing is excluded as it is dealt with extensively in Challenge 1 which deals with living marine resources. The challenges to unlocking the economic potential is similar across the sectors and include: lack of basic human capacity and technical skills throughout the value chain processes; lack of supporting and enabling governance frameworks; lack of surveys and knowledge on resource potential especially with regards to oil, gas and other mining and the lack of industrial infrastructure (Ibid., 12-15).

The SAP proposes several Strategic Solutions to the Challenges. The Solutions in the SAP are categorized into eight areas that identify Action Responses to the Challenges (Ibid., 16-24). While the Challenges do not directly reference ecosystem-based management, the Action Responses do refer to ecosystem-based interventions. Of the 41 Action Responses identified, all could be considered to be contributing to some aspect of EBM, however 10 are assessed to be contributing more directly or immediately than the remaining 31 in this analysis in terms of how they are worded. The Action Responses were regarded as potentially contributing more directly to EBM if they referenced concepts such as ecosystem, transboundary, shared resources or joint interventions in their wording. These are summarized in Table 7 with Action Responses that are assessed to be contributing more immediately to ecosystem-based management highlighted. The identified Action Responses were then assessed in terms of the extent to which they have been implemented. The scoring was awarded across a range from 0; 1; and 2, with 0 being no ecosystem-wide product in any form relating to the Action Response, 1 being awarded if there exists a science report and or recommendation on the Action Response and 2 was awarded if the Commission decided on a transboundary action or management intervention, including any guidelines to countries regarding the Action Response.

Table 7. Action Responses within proposed Strategic Solutions in the Strategic Action Plan of the BCC (BCC, 2014). (Action responses that directly relate to Ecosystem Based Management are highlighted with an assessment of the extent to which this has been achieved in the period 2015 to 2019.)

	Strategic Solution	Action Response	Achievement Rating (0-2)
1	Living marine resources		
		1. Ascertain which stocks are marine transboundary resources.	1
		2. Manage shared stocks cooperatively by harmonizing research and management planning and implementation.	0
		3. Implement ecosystem-based management.	1
		4. Ensure compliance with management and conservation measures.	
2	Non-living marine resources		
		5. Understand the ecosystem impacts of exploration and extraction activities.	1
		6. Integrate and implement international standards for exploration and extraction.	
		7. Adoption and use of Integrated Ocean and Coastal Management	
3	Productivity and environmental variability		
		8. Improve the understanding of the BCLME ecosystem.	2
		9. Improve the understanding and predictability of climate change impacts and climate variability at seasonal inter-annual and longer time scales.	
		10. Improve the understanding of Harmful Algal Blooms and hypoxia.	
4	Pollution		
		11. Monitor and manage coastal water quality around pollution “hotspots”.	
		12. Improve the understanding of river pollution in the BCLME.	1
		13. Prevent, abate, mitigate and prepare for oil spills.	
		14. Prevent, abate and mitigate against marine litter.	
		15. Understand the impacts of noise pollution and mitigate as necessary.	
		16. Reduce emissions of greenhouse gases.	
5	Ecosystem health and biodiversity		
		17. Reduce threats to species and habitats.	
		18. Strengthen ability to monitor ecosystem health.	1
6	Human dimensions		
		19. Ensure consistency of human dimension data across countries.	0
		20. Expand the knowledge base in respect to human dimensions in the BCLME region.	1
		21. Incorporate human dimensions into resource management decision-making.	
		22. Implement regional cooperation for safety-at-sea.	
		23. Develop constructive participation by stakeholders and reduce conflicts.	
		24. Enhance the economic development potential.	
7	Enhance the economic development potential		
		25. Adoption and use of Integrated Ocean and Coastal Management.	
		26. Develop a supportive funding and revenue model for infrastructure and operations in marine transport.	
		27. Develop adequate infrastructure such as port facilities, pipeline networks to enable successful offshore oil and gas exploration.	
		28. Develop an integrated plan for skills development for offshore oil and gas sector.	
		29. Establish a funding mechanism to address challenges in financing aquaculture and improve market accessibility.	

	Strategic Solution	Action Response	Achievement Rating (0-2)
		30. Conduct research to better understand methods for extracting minerals in a responsible and sustainable manner.	
		31. Manage competition for shared resources/space by employing adequate spatial planning.	0
		32. Enhance key economic sectors, e.g. marine transport and manufacturing; offshore oil and gas; fisheries; integrated ocean governance and protection to achieve sustainable ocean development through integrated ocean governance and marine spatial planning.	
		33. Harmonize mitigation measures related to extraction activities to minimize environmental impacts and ensure that monitoring standards are of international quality.	
8	Governance		
		34. Strengthen national human capacity to participate in BCC processes.	
		35. Strengthen national institutional capacity and mechanisms to implement the SAP and IP.	
		36. Strengthen and harmonize policy and legislative frameworks.	
		37. Strengthen information, communication and awareness mechanisms.	
		38. Strengthen the governance structures and procedures for the BCC.	
		39. Strengthen regional and international cooperation.	
		40. Establish sustainable financing mechanisms.	
		41. Review and monitor progress in implementing the SAP.	

The Action Responses that directly referenced transboundary interventions or impacts around shared resources numbered less than 10% (10 of 41). Even if the 8 Action Responses contained in the Governance Strategic Solution category are included, giving these the benefit of a broad ecosystem-wide interpretation, the number of Transboundary Actions considered to be ecosystem-wide are few. It can therefore be contemplated that the Action Responses are not framed in a manner that focuses the work of the BCC at ecosystem-wide impact through ecosystem-based management.

The scoring of achievement around the Action Responses was difficult to assess. The difficulty arose because the Strategic Action Plan did not have an implementation plan or business plan attached to it. The projects implemented by the BCC, as described in the following section, also did not directly reference the Strategic Solution or Action items in their proposed work plans. The projects did produce several reports and science outcomes. These however, did not translate into transboundary decisions at the Commission or Inter-Ministerial Meeting levels. The science outcomes of the projects are described within the brief project descriptions below. The only Action Response that did receive a score of 2, denoting a decision at the Commission level, was that of “Improving the understanding of the BCLME”. The Commission approved recommendations of the EAC for various studies of the region. The Commission also approved that the EAC works through several transboundary Science Working Groups. Science Working Groups include the Small Pelagic Fisheries Working Group, the Demersal Fisheries Working Group, the Top Predator Working Group, the Environmental Monitoring Working Group and the Science Infrastructure Working Group. The last two Working Groups were established in 2018 towards promoting more science coordination across the three countries. The Compliance Committee was also only established as a working committee in 2018 to promote ecosystem-wide compliance measures. With the establishment of this Committee, the BCC had its full functional structure as set out in the Convention. Regional Ecological and Biological Significant Areas and Marine Spatial Planning Working Groups were also established under the MARISA project described below.

5.3.2.2. The Marine Spatial Management and Governance Programme (MARSIMA)

The MARISMA project is funded by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), with in-kind co-funding contributions by the BCC and its Member States. The project is implemented by the German Development Cooperation (GIZ) which has, since the project inception, set up a project office in Swakopmund, Namibia. The project is funded over five years ending in 2020, with a funding allocation of 8.9 million Euros from the BMUB.

The MARISMA Project has two broad areas of output: Marine Spatial Planning (MSP) and the identification of Ecological and Biological Significant Areas (MARISMA, 2018). The project aims to produce marine spatial plans at the National and Regional level and also to update atlases of Ecological and Biological Significant Areas (EBSAs) in the BCLME. As a support tool to these outcomes the project has created a Spatial Data Portal. The MSP and EBSA outcomes align directly with the EBM approach, as during the MSP processes individual and aggregated pressures on the ecosystem will have to be identified and suitable management interventions developed and recommended. The EBSA identification process will guide countries and the Commission in the management interventions selected for these areas that may require additional protection. The project approach has been to set up national and regional working groups for MSP and EBSAs. This process of engagement intends to have a positive capacity building impact relating to regional cooperative governance and EBM. The Project produced a Regional MSP Strategy that was adopted the Commission in 2018. This can be viewed as a regional endorsement of MSP as a governance approach and endorsement of the strategy and processes outlined by the MARISA project.

5.3.2.3. Enhancing Climate Change Resilience in the Benguela Current Fisheries System

This project is presented as delivering climate change adaptation strategies to marine fisheries and aquaculture sectors. The project objective is to build resilience and reduce vulnerability to climate change and to ensure food and livelihood security (BCC Climate Change Project, 2018). The Project is funded by the Global Environment Facility (GEF) with in-kind contributions from the BCC Parties. The Project duration is five years and ends in 2020.

The Project seeks to produce outcomes in three technical components and a fourth overarching component that aims to draw lessons on implementing adaptation interventions from the three technical components. The three technical components are: the inclusion of actions in national and regional policies to address climate change and variability; adaptation actions implemented at selected pilot sites; and the increasing of awareness and capacity to promote a “forward-looking approach to climate change”. Project Strategies in the Project Description are noted as the inclusion of adaptation interventions for fisher communities as an integral component to all government policies, and these considerations must not be marginal to government planning. The Project, although still being implemented, does list some key outcomes such as the Community-Level Socio-ecological

Vulnerability Assessments in the Benguela Current Large Marine Ecosystem; Training Manual and Guidelines for Conducting Community-level Rapid Vulnerability Assessments (RVA) and the Community-level Rapid Vulnerability Assessment to inform adaptation planning in Henties Bay, Namibia.

This climate change adaptation project contributes to EBM in that it seeks to identify ecosystem shifts, change and variability and then seeks to create human resilience through adaptation. While it may not include the human dimension as a component of the ecosystem as motivated in some more recent literature on EBM (Link & Browman, 2017), the project does highlight that environmental responses to climate change will include changes at the ecosystem level. These will impact the availability of ecosystem goods and services to coastal communities such as the availability of fish stocks. The project seeks to have impactful interventions at pilot sites, and therefore does not appear to have a single overarching common transboundary outcome. The governance outcome of encouraging and facilitating the incorporation of mitigation measures in polices of the three-party states, could however be broadly considered an ecosystem-wide policy level intervention. These policy interventions at the national level may or may not be similar across the three states.

5.3.2.4. Improving Ocean Governance in the Benguela Large Marine Ecosystem Project (BCLME III)

The BCLME III Project builds on the BCLME I and II Projects which supported the creation of the BCC. These earlier projects were also funded by the GEF and implemented in cooperation with the United Nations Development Programme. The BCLME III project is implemented from 2017 to 2022, and is funded at 10.9 million US$, with in-kind support funding from the BCC Member States.

The Objective of this third funding phase is to promote in actionable ways the cooperative and shared governance of the BCLME. It aims to achieve this by mainstreaming transboundary benefits, challenges, concepts and discussions into national policies of the three Member States. The Outcomes of this Project are described in Four Components (BCLME III, 2018): Improved Ocean and Coastal

Governance; Stakeholder Engagement and Partnership Collaborations; Capacity Development and Training; and Marketing, Resource Mobilization and Fiscal Sustainability.

This project seeks to directly enable EBM by bolstering the cooperation across the three Member States through the integration of policy and actions horizontally across the three States, including supporting national ministries in incorporating transboundary concepts. The Project fully recognizes the transboundary nature of implementing EBM, and that EBM must incorporate an integrated perception of the economic, environmental and social benefits. Implementation of the project is ongoing and no output reports could be identified as yet in early 2020.

Significantly, planned outcomes of the project include reviewing the Strategic Action Plan and improving regional governance and cooperation. This includes a review of the functioning of the Benguela Current Convention structures towards improving governance and the resulting impact of such a transboundary commission. Criteria for success of this project must be the measurement of articulated and implemented transboundary policy interventions. The approved project outcomes appear to be a recognition that the BCC needs to function more impactfully at the ecosystem-wide scale.

5.3.2.5. Development of Ecologically Sustainable Fisheries Practices in the Benguela Current Large Marine Ecosystem (ECOFISH)

The ECOFISH Project was funded by the European Union and was implemented from 2010 to 2016. It focused on reviewing and enhancing fisheries and fishery stock assessment science. The Project has completed a number of reports, and has produced post-graduate degrees in addition to other short training interventions such as seminars and workshops (ECOFISH Project Report, 2018). The project reviewed stock assessment techniques across the three countries, developed intercalibration models across Party States, and established, through evidence, distinct and shared transboundary stocks.

The Project, although apparently narrowly focused on fisheries, did achieve to illustrate the transboundary nature of the Benguela Ecosystem through system processes and shared fish stocks. Its work and knowledge products strongly supported that the BCLME must be managed as a shared ecosystem. In the process of undertaking its work programme, the Project established the Demersal and Pelagic Fisheries Science Working Groups. These Working Groups continue to provide a platform to facilitate ecosystem-wide discussions and collaborations, including planning and undertaking research into shared fish stocks such as the demersal hakes and small pelagic fish. While the project has identified shared fish stocks in the region, there has been no decision on shared management models for any species or group of species at the Commission level.

5.3.2.6. Benguela Current Commission – Norwegian Science Plan (2016-2017)

The Benguela Current Commission website acknowledges Norwegian support for various ocean science programmes over the last three decades. These initially focused on fish stock surveys of the major offshore fish stocks in the region. These surveys were undertaken with the research ship the *Dr Fridtjof Nansen*, which was contracted from a United Nations Food and Agricultural Organisation (FAO) programme by the Norwegian Institute for Marine Research. These surveys produced several reports on fish stock status over the last two decades (BCC-Norway Science Programme, 2018).

More recently and in response to the SAP Response Actions to be more EBM focused, the BCC-Norwegian collaboration implemented a two-year (2016-2017) Ecosystem-Based Management Programme. This programme produced several ecosystem related reports: Reduced Threats to Species and Habitats; Strengthening Ability to Monitor Ecosystem Health; Strengthening the Fisheries Management in the BCLME through the Application of Ecosystem Risk Assessment; and Identifying, Monitoring and Managing Pollution at Hotspot Locations (Hamukuaya, 2017). The programme also funded the drafting of water quality guidelines; including monitoring and indicators considerations. Prior to the focused

Ecosystem-Based Management Programme of 2016-17, similar Norwegian-FAO partnership programmes delivered reports and recommendations on the inclusion of human dimensions in fisheries management, including small-scale fishers in the region (Paterson et al., 2012).

The Benguela Current Commission ecosystem assessment objectives continue to benefit from the 2019 Ecosystem Approach to Fisheries (EAF) Nansen Programme (FAO, 2019). This is a United Nations Food and Agricultural Programme that allows for the deployment of the research and fisheries survey vessel, the *Dr Fridjof Nansen*, to various developing country regions to undertake fisheries directed and fisheries-ecosystem-interactions scientific surveys. The programme also includes several fisheries science and management training programmes and interventions. The ship and surveys are largely funded by the Norwegian Government.

The evolution of the BCC-Norwegian Science programmes from very focused fish stock surveys to broader ecosystems and human dimensions considerations demonstrates the intention of the BCC to build capacity towards implementing EBM at the regional and ecosystem level.

5.5. Conclusion: The Benguela current Commission and Implementing the Ecosystem-Based Approach to Marine Management

Implementing ecosystem-based management (EBM) is complex. This complexity is demonstrated in an increasing trend across management agencies towards the incorporation of several dimensions and interactions across the environment, society and economy (Arkema et al., 2006; Karsenti et al., 2011; Link & Browman, 2014, 2017).

Effective marine management, must be undertaken at the functional ecosystem level. This is because perceiving drivers and formulating responses at a scale lower than this will be incomplete and ineffective. For instance, national management of only a percentage of a shared fish stock will be ineffective if a significant portion of the biomass or catch, occurring in a neighbouring country, is not considered in the assessment or management of the fish stock. Similarly managing seals or seabirds as key species of an ecosystem in one country or location only, will not be effective if the management does not include life stages such as breeding, feeding or nursery grounds that occur in other countries or locations sharing that ecosystem (Crawford, 2007). Management interventions that are determined at a scale lower than the ecosystem level may be spurious and have unintended consequences. To implement EBM in the ocean space, the rational functional ecosystem unit has been accepted as the large marine ecosystem (Sherman, 2014a, 2014b; Sherman & Hamukuaya, 2016; Duda, 2019).

Governance and legal frameworks, along with basic knowledge generation of the ecosystem and communication across various stakeholders are identified as primary challenges to implementing EBM at regional or large marine ecosystem scales (Marshak et al., 2017). The Benguela Current Commission responds to these challenges to varying degrees and levels of success. The Commission itself, as a regional body that meets regularly, represents a governance framework that can develop cooperation around the understanding and management of the Benguela Current Large Marine Ecosystem. The improved understanding of the Benguela Current Large Marine Ecosystem is evidenced by the several science reports produced. From the early transboundary initiatives that were very focused on fish stock assessments, more recent reports, produced by the various major projects, have included more ecosystem considerations including human dimension aspects. These challenges of governance and legal frameworks in implementing EBM at the regional scale are then potentially addressed by the Benguela Current Convention, the working structures of the Commission and the current Strategic Action Plan.

The Ecosystem Advisory Committee of the Commission serves to build a knowledge platform on which to make recommendations on environmental management at the ecosystem scale. The Compliance Committee similarly is expected to develop and facilitate implementation of compliance interventions across the three countries. The 2015–2019 BCC Strategic Action (BCC, 2014) poses Challenges and Action Responses levelled at transboundary and ecosystem scales as well. Not all of the Action Responses are specifically framed at transboundary actions. This does leave open to interpretation as to whether the countries can act individually on these, or if the objective is to have a joint programme of action. Acting individually to respond to the Action Responses that are not framed as a transboundary action will still have the positive effect of promoting actions that are at least aligned strategically, albeit not coordinated operationally. To optimize investment, efficiencies and impact, the Commission must consider framing all of its Action Responses in the next Strategic Action Plan in transboundary terms. This will have the added advantage of focusing proposal drafting and funding applications at ecosystem-wide outcomes. A further option is to have a combination of transboundary and national or local interactions so that objectives and outcomes are strategically aligned, and local implementation may enjoy the benefits of shared experiences and leanings.

Several of the projects implemented by the Commission over the last decade have had a focus on ecosystem functioning and management, specifically the recent joint BCC-Norwegian Science Programme, that focused on ecosystem health and the German funded MARISMA project focusing on Marine Spatial Planning and the identification of Ecological and Biological Significant Areas.

The Benguela Current Commission therefore does contribute positively to EBM by both providing an ecosystem-level governance institution and by developing a growing knowledge base of the marine ecosystem. The Commission provides a three-country platform for ecosystem-level discussions to occur, and for knowledge to be assimilated and interventions framed. This responds to the challenges of regional governance and legal frameworks, ecosystem scale knowledge platforms and improved communications as outlined in reviews of EBM operationalization (Jay et al., 2016; Buhl-Mortensen et al., 2017; Marshak et al., 2017; Österblom et al., 2017). These reviews do however also highlight the challenge of implementing governance and management measures. While interventions may be framed through intercountry processes, implementation of these must occur at the country level. Individual countries in any Large Marine Ecosystem, including the Benguela Current, have their individual set of processes, for national policy formulation, stakeholder engagement and implementation. More importantly each country also has their own set of strategic and government priorities.

The Benguela Current Convention does not outline or stipulate the relationship of its decisions with National Departments. Like all multinational Conventions, the BCC must respect national sovereignty. The analyses of implementation of Action Responses shows that the Commission has not moved beyond science reports to making decisions on EBM implementation at the large marine ecosystem level. The Commission to date has not adopted any transboundary actions or ecosystem level actions. It has performed well in commissioning and receiving science products but has not acted on these. This may be a result of the ambiguous or unclarified nature of the Commission as it relates to national departments. The Convention text describes the output of the Commission in terms of “agree on; promote; encourage; support”, with the term “ensure” only used with reference to funding and long-term operations of the Commission (BCC, 2013, p. 6).

The Benguela Current Commission, in its formulation of its first Strategic Action Plan only frames 10% of its Action Responses in transboundary terms. This suggests that the Commission has some way to go in terms of evolution towards building a transboundary operationalization of its work.

Possible interventions based on existing science products, could have been a model for sharing fish stocks, such as the hake stock. Studies undertaken within projects implemented by the Commission have confirmed that this stock is shared (Hamukuaya et al., 2016). The Commission has not as yet decided on instructing the EAC to develop a shared model for implementation. Uniform approaches towards mitigating pollution such as common approaches to or thresholds for chemical pollution such as heavy metals or persistent organic pollutants also presents opportunities for ecosystem-wide interventions. These are pollution aspects where there are generally existing global and regional agreement on the need for mitigation (Valiullina et al., 2019).

During the interviews of both industry and BCC country representatives, a consideration for the lack of progress on the shared model for the hake stock was articulated. South Africa’s hake fishery is Marine Stewardship Council (MSC) certified. This allows for access and export to EU markets. Namibia’s hake fishery is not certified. A shared management model without Namibia being certified may compromise the South African MSC certification. This however, can be mitigated if the Commission, as a management intervention sought to support the certification of the hake fisheries of the region. Similarly, as a practical recommendation, the Commission could follow the guides suggested by the FAO on the implementation and assessment of biodiversity considerations and ecosystem approaches to fisheries across the three countries (Friedman et al., 2018). This will allow coordinated and coherent interventions at the ecosystem level.

The Commission, through the science programmes it supported, has produced extensive basic descriptions of ecosystem functioning, and early descriptions of social and economic dimensions of the BCLME. An evolution of this science information will be to implement the use of indicators for various aspects of ecosystem health of the BCLME. Included in the use of indicators must be thresholds or limits, upon which the party states must act. This could be similar to EU Directive approach discussed in Chapter 4. The thresholds must relate to the objectives of the Convention. The formulation of indicators and thresholds is increasingly being motivated in ecosystems management. The identification of indicators and thresholds allows for discussions on tipping points in the functioning of the system. Tipping points in the functioning of systems signal significant changes in the system’s ability to maintain and provide its ecosystem services (Tallis et al., 2012; Österblom et al., 2017; Lombard et al., 2019b). Indicators, thresholds and tipping points should be considered as a key performance area of the next Strategic Action Plan. This will focus the work of the BCC at the transboundary scale.

The BCC has succeeded in creating a transboundary, trans-national platform for ecosystem-wide discussions. It has also made positive moves towards including and linking people and society considerations in the management of the Benguela System through is objectives and some specific research programmes. Chapter Four identifies the integration of natural and social sciences as a research area requiring investment in South Africa. There appears to be a similar requirement in the BCC. The Strategic Action Plan of the BCC incorporates expanding sustainable use from the existing fisheries to aquaculture, oil and gas and other emerging industries. Parallel to this, the BCC describes challenges and action steps around understanding and mitigating the potential harmful impacts of these industries on the marine ecosystem. While the most recent science programmes have delivered considerations for habitat and species protection (Kirkman et al., 2016), and at least one study has produced an economic evaluation of fisheries sector of the BCLME (Sumaila, 2016), there still remains a need to build a science and knowledge base for the integration of natural, social and economic observations and projections. This will allow for ecosystem management and policy interventions that will more fully incorporate human dimensions as an integrated driver and component of the ecosystem (Levrel et al., 2014; Cvitanovic et al., 2015; Shabtay et al., 2018b). For EBM to be effective at the large marine ecosystem scale, interventions aimed at impacting human-ecosystem interactions must be planned and implemented at this scale.

The Benguela Current Commission is a positive step towards EBM, through creating a regional governance and legal framework, facilitating communication across key Ministries and generating science knowledge at the ecosystem scale. It has had limited success in converting its work into transboundary management decisions and interventions.

Like any regional multilateral institution, the BCC, is constrained in the extent to which it can impact policy formulation and implementation at the national level. There is an argument that the regional seas governance frameworks must be able to move out of their constraint of being subject to national policy if they are to be more effective (van Tatenhove, 2013; Raakjaer et al., 2014; van Leeuwen et al., 2014; van Tatenhove, 2017). Van Tatenhove, for instance, suggests that Transboundary Marine Spatial Planning (TMSP) must be developed as a “reflexive governance arrangement”, where transboundary policy formulation must challenge existing norms and directions of nationally focused marine spatial planning (van Tatenhove, 2017). This will be an ambitious governance target for South Africa and the Benguela Current Commission as it sets out to implement marine spatial planning. The Commission and its working groups are largely comprised of government officials and scientists, and this will make working outside of national policies difficult.

Other Regional Seas Conventions like the Helsinki Commission for the Baltic Sea and the OSPAR Convention for the North East Atlantic, work to decide on legally binding decisions to manage and improve the health status of the regional seas they cover (HELCOM, 2019; OSPAR, 2019). The BCC Convention does make allowances for agreeing on joint management measures, harvest levels and sharing arrangements. The BCC does require institutional learning through a first practical implementation of such a joint measure. This learning will establish the national mechanisms of how the three countries will interpret and implement such an ecosystem-wide decision as binding across various national departments.

Regional Programmes like the Benguela Current Commission are necessary to implement ecosystem-based management. In addition to providing for a Governance Framework to approve regional and ecosystem-wide policy interventions, they allow for data gathering, status reporting and facilitating the exchange of human expertise across the ecosystem. National management of the Benguela Current Ecosystem without transboundary cooperation will be incomplete. Similarly, South Africa will have to consider similar working arrangements for the east coast, Agulhas Current Ecosystem. South Africa’s partners in this system will include both mainland and island nations of east Africa, with working languages being English, French, Portuguese and Swahili. There is the existing opportunity of the Abidjan and Nairobi Conventions on the west and east coasts of Africa that have a focus on marine and coastal management. These Conventions have a long history of policy discussion, and project implementation, often with established working arrangements at the country level (Diop & Scheren, 2016). Such arrangements will provide initial capacity to build regional governance mechanisms. For instance, the Nairobi Convention more recently has developed a programme on pollution management for the east African region called WIO-SAP which is the implementation of the Strategic Action Programme for the protection of the Western Indian Ocean from land-based sources and activities.

Even beyond the transboundary governance arguments, some authors are motivating that management considerations for the ocean must include planetary or earth system scales. This is because social and more especially the economic trends, that drive local behaviour operate at the global scale in the modem world (Galaz et al., 2012; Österblom et al., 2017). Österblom, 2017, describes these global issues as distal interactions and includes such concepts as advancing technological solutions across marine industries, safety and security, global politics, international trends in trade and commerce, and climate change. These factors do have an influence on how marine ecosystems are used and managed locally. Their influence is not as easily discernible as the more local or proximal interactions such as fishing or habitat loss. However, drivers of proximal impacts such as fishing and habitat loss may have their origin in the more distal or removed influences.

Beyond their provision of providing a regional governance and legal framework for ecosystem-based management, Commissions such the BCC can play a role in linking and perceiving the interactions between proximal and distal influences on marine ecosystems.

6. The Building of South Africa's Ocean Economy: Considerations for the Implementation of Marine Spatial Planning in South Africa

6.1. Introduction

While considering the White Paper on the National Environmental Management of the Oceans (NEMO, 2014) the Cabinet Ministers also considered the development of the South African Oceans Economy. In December 2013 the South African Cabinet approved the NEMO policy and as part of that decision instructed that an ocean economy development plan must be constructed (South African Cabinet, 2013). In the following year the Presidency coordinated together with the National Department of Environmental Affairs a "Big Fast Results" planning process, called Operation Phakisa: Oceans Economy Programme. The process included senior representatives from a wide range of government departments and agencies, representatives from non-governmental organizations, universities and the ocean industry sectors. It was decided to divide this planning process into four sectors of work: Offshore Oil and Gas; Marine Transport and Manufacturing; Aquaculture; and Marine Protection Services and Governance. All representatives were convened in the port city of Durban in the KwaZulu-Natal Province for a period of 6 weeks in the third quarter of 2014. The objective of the six-week workshop was for each sector to determine sector targets over the next 5, 10 and 20 years and in particular to develop tasks and deliverables over the next five years that will support the achievement of targets. Depending on expertise, sector experience or representation, attendees at the Phakisa planning process were organised into four "sector laboratories". The "laboratories" had to draft outcomes and plans to a detailed scale during the six weeks and included allocating tasks to responsible persons, with time frames and funding requirements. Within two months after these planning "laboratories" were complete, the President held an open day on October 15th 2014 to launch these plans publicly. Details of the many projects contained within each area of work were also presented to the public, and archived on the website of the Presidency (DPME: Operation Phakisa, 2018).

The three industrial sector laboratories developed industry growth targets. The fourth sector developed ocean governance initiatives that were intended to enable the development of the ocean economy sustainably through various governance and environmental protection measures.

Marine and Coastal Tourism and Small Harbours were two further industrial sectors that were added to the Phakisa: Ocean Economy Programme through smaller focused "laboratories" in 2017 and 2018.

South Africa does have a relatively long coastline, about 3000 kilometres and a large uncontested Exclusive Economic Zone (EEZ), as described in Chapter One. The EEZ is uncontested as South Africa can claim the maximum allowable EEZ under the United Nations Law of the Sea without overlapping with any other country EEZ, except for any relatively minor overlaps with Namibia on the west and Mozambique on the east, where there are contiguous coastlines. South Africa could also claim much of its extended continental shelf allowed under UNCLOS without major areas of overlap with other countries EEZs. However, if all the national marine sectors are grown together in South Africa, there will be overlapping areas of industrial sector activity, and these overlaps will require varying degrees of management depending on the nature and severity of their impact.

In addition to the objectives of growing the industrial sectors identified for the Phakisa planning; there are also existing sectors such as the various fisheries, shipping, mining and marine ecotourism activities. A further important consideration is that South Africa is a mega bio-diverse country and has a rich natural heritage that requires protection and conservation considerations. Marine spatial planning will be required to manage the space requirements for these multiple ocean sectors.

The NEMO policy advocates a coordinated approach to marine ecosystem management, through marine spatial planning. Marine Spatial Planning (MSP) is a novel concept in South Africa environmental planning, and is viewed in this study as an area of advancement to the existing policy and legislative framework.

Marine Spatial Planning (MSP) has been used internationally to define priorities and preferences for ocean area usage. Proponents of MSP motivate that it achieves optimal spatial planning for ocean uses while having due regard for conservation and maintaining ecosystem functioning and integrity. Definitions of MSP have evolved to include that it is a public process to emphasize the need for fuller stakeholder participation. Marine Spatial Planning is formally defined by Ehler and Douwer as being " a public process of analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic and social objectives that are usually specified through a political process" (Ehler & Douvre, 2009, p. 24). Chapter Three of the study provides a more detailed overview of MSP and how it has been incorporated in several country's national ocean policies, including how this concept emerged in the South African Green and White Papers on Environmental Management of the Ocean. MSP remains one among other governance tools, and advocates and detractors of the tool note that like other tools, its effectives lies in its method of implementation.

Marine spatial planning has become the mainstream management tool for ocean spaces, much like Integrated Coastal Management evolved as the conceptual ideology for coastal management in the previous two decades (Smythe, 2017; Smythe & McCann, 2018). Marine spatial planning has much of its early formal development in the European Union (Qiu & Jones, 2013) and Norway (Knol, 2011) but there now exists examples of MSP in several regions across the world including the Middle East, European Union and South America (Portman, 2015; Jones et al., 2016; Prestrelo & Vianna, 2016).

The South African White Paper on the National Environmental Management of the Ocean identifies regional planning areas for MSP: the West Coast, East Coast, South East Coast and the twin-island sub-Antarctic territory – the Prince Edward Islands (NEMO, 2014). The Planning Areas are further defined in the South African

Approach to Marine Spatial Planning published by the Minister of Environmental Affairs in August 2019 (Marine Spatial Planning Approach, 2019).

This Chapter describes the current and potential uses of marine ecosystems in South Africa, and includes a description of the Phakisa Ocean Economy Targets that were set in 2014. Existing and potential ocean sectors and their activity levels per planning area are not described exhaustively. These are however described in sufficient detail to demonstrate the potential overlap of uses and substantiate the need for marine spatial planning. Types of interactions across the ocean sectors were categorised relative to their positive, negative or neutral impact on other sectors. These analyses allow for spatial planning considerations of sectors that can coexist to varying degrees and those that will not be able to coexist.

Generic decision criteria and processes are developed through Decision Trees as options for guidance in the marine spatial planning processes in South Africa. These decision criteria are deduced from present government priorities, as well as stated objectives of the NEMO policy. These may be applied to any of the identified planning areas. Decision criteria and other considerations for implementing MSP in South Africa are informed by reviewing other country processes described in Chapter Three, from the published South African MSP Approach (Ibid) and from a series of key informant interviews.

6.2. Research Methods

Existing and potential ocean uses in South Africa were described and assessed for their activity footprint in the ocean and coastal space around South Africa. Potential uses were determined from published targets and outcomes for the Phakisa Oceans Economy Programme and from literature review of South African ocean sectors. The ocean sectors included the six work areas of the Phakisa Oceans Economy Programme, namely: Offshore Oil and Gas; Marine Transport and Manufacturing; Aquaculture; Marine Protection Services and Governance; Marine and Coastal Tourism and Small Harbours. While the fisheries sector is discussed below as an existing use only, other uses are discussed as having both existing and potential aspects. This is due to many of the sectors having at least some existing activity with further developments planned. The sectors were then determined to be extractive or non-extractive and differentiated into targeting living or non-living resources.

The NEMO White Paper defines four marine spatial planning regions; the West Coast; South East Coast; East Coast and Prince Edward Islands. These planning areas are refined and published in the draft Marine Spatial Planning Approach (Ibid). Inputs into the various active ocean sectors per planning area were assessed to determine which sectors draw on the same inputs. Inputs to a sector describe the “raw materials” required by that sector in order for it to have or realise the value associated with it, and include natural resources, ecosystem processes, economic infrastructure and social benefit. The inputs per sector for each of the four planning areas are listed in Tables 10, 11, 12 and 13 below. The input definition was adapted from previous ocean economic valuation studies (De Groot et al., 2002; Klinger et al., 2018). An addition to previous studies was the category of pollution dispersion as an input. All sectors will at some point have an impact on the environment that must be absorbed or ameliorated by the ocean (Matheson, 2019). This pollution category is the primary input required for industrial and waste water pipelines.

A further notable addition, and of particular relevance to the South African history, is the inclusion of the concept of access to the previously identified cultural and aesthetic services input. South Africa, through its history of state imposed racial segregation and discrimination, limited access to coastal areas for racial groups that were considered Black or of non-White race status. This system of discrimination is known as apartheid, and had its beginning with the arrival of colonising European nations to South Africa. This governance system ended in 1994, with elections that allowed all race groups to vote with equal rights. Since 1994, access to land has been a major political and social issue in South Africa, and access to coastal land and resources is very much included in this debate (Cousins & Kepe, 2004; Sunde et al., 2008; Masterson., 2019; Lombard et al., 2020). Access to coastal land and resources is therefore included as an input to the various ocean sectors, as it must be a defined consideration in marine spatial planning in South Africa. This will be further elaborated on in the discussion.

The ocean sectors are then matched against each other to assess potential for conflict and synergy based on the inputs they require. These will be assessed using the methodology proposed by Klinger and co-workers that categorizes ocean sector interactions into: Competition; Antagonism; Amensalism; Commensalism and Mutualism; depending on the level of positive or negative impact each sector has on the other (Klinger et al., 2018). These categories are defined in Table 8. Synergistic relationships occur when one or both of the sectors interacting benefit, and none of the sectors are negatively impacted and includes Mutualism and Commensalism. Antagonistic relationships occur when at least one of the sectors is negatively impacted, and includes Competition; Antagonism and Amensalism.

Table 8. Categories of Ocean Industrial Sector Interaction and their Definitions from Klinger et al., (2018).

No.	**Interaction Category**	**Definition**
1.	Competition	All sectors are negatively impacted
2.	Antagonism	One sector benefits positively and the other sector is negatively impacted
3.	Amensalism	One sector is negatively impacted and the other sector is unaffected
4.	Commensalism	One sector benefits and the other sector is unaffected
5.	Mutualism	All sectors benefit from each other operating in the same space

Based on the subjective interpretation of the interactions, a summary of interactions across the various ocean industry sectors is presented in Table 14.
Marine spatial planning decision criteria and approaches are developed from stated South African government objectives. These are presented in the form of Decision Trees (Figures 22 and 23) that can be implemented generically in any of the regional marine spatial planning areas.

Considerations for assessing interactions across ocean sectors and developing the Decision Trees were derived from the literature reviewed in Chapters 2, 3, 4 and

5; a series of interviews undertaken with key informants which included senior government and non-government officials and representatives; and from the researcher/student's experience. The 21 key informants are categorized into their employment sector in Appendix 4: Table 19. A fuller discussion of interviewee responses is undertaken in Chapter 7.

6.3. Potential and Existing Uses of Marine Ecosystems in South Africa

Marine spatial planning will need to balance and manage existing uses and potential new uses. South Africa's new uses will largely be determined by the economic objectives planned in the Operation Phakisa industrial sectors of Oil and Gas; Marine Transport and Manufacturing and Aquaculture. During 2016 and 2018 similar, albeit smaller (fewer participants) Phakisa Laboratories focused on Coastal and Marine Tourism or Ecotourism and Small Harbour Development. These sectors, like the other Phakisa initiatives, are not entirely new sectors, and were selected as Phakisa initiatives for their perceived growth potential. These recently added sectors of Coastal and Marine Ecotourism and Small Harbours are also described in this section.

Besides the growth of the Phakisa ocean industry sectors through directed government interventions, there will also be growth in other ocean sectors following global trends. Global trends include increased under-sea cables for internet connectivity, exploration for discovery of beneficial genetic, chemical elements and compounds, desalination, alternative energy production and further exploration of atmospheric carbon capture and storage potential (Kyriazi et al., 2016; Zanuttigh et al., 2016; Buhl-Mortensen et al., 2017). These are important to note as national marine spatial planning should not be caught off guard by these sectors that will have to be added in at a later stage.

The Operation Phakisa Programme outlined the development of the South African Ocean Economy, and included new sectors as well as growing existing sectors. These new objectives and their impact will need to be incorporated into the spatial plans while recognizing that South Africa does have existing uses. Existing uses in

South Africa include commercial fishing with more than a 100-year history, subsistence fishing with histories of several hundreds of years, diamond mining and shipping activities also have histories that have grown over the last century (NEMO, 2012).

South Africa, being a mega-biodiverse country does have a high conservation imperative (National Biodiversity Strategy and Action Plan, 2015). The conservation imperative will impact spatial planning as ecological and biological significant areas have to be recognised and awarded necessary protection for maintenance or rehabilitation. This must be achieved while accommodating the space for and impacts of the ocean industry sectors. The following description shows that the South Africa ocean economy development has several areas of nodal activity. Many of these will have to be grown simultaneously to meet the ocean development objectives. While this does pose several challenges, it also presents the opportunity to appreciate the accumulated and aggregated impacts and benefits at an early planning stage in the marine spatial planning process.

6.3.1. South African Marine Industry Sectors

The ocean sectors are not easily divided in this discussion into potential and existing uses. All of the Phakisa Ocean Economy Areas did have some existing activities prior to 2014. Table 9 illustrates the existing and potential ocean uses in South Africa. Categories were modified from previous marine economic classification studies that sought to identify categories through various conceptualizations such as extractive, non-extractive; industrial sectors, and whether these were harvest or construction based and if so, did they target living or non-living resources (Colgan, 2003, 2016; Surı´s-Regueiro et al., 2013; Park & Kildow, 2014; Klinger et al., 2018).

*Table 9. Classification of Potential and Existing Ocean Uses in South Africa. Phakisa Ocean Economy Programmes are marked with an *.*

Classification	Ocean Goods	Sector
Extractive	Living Marine Resources	Fisheries
		Aquaculture *
		Biodiscovery (Pharmaceutical Derivatives)
		Education and Research & Development (biological sampling)
	Non-Living Marine Resources	Oil & Gas *
		Minerals & Elements (coastal & seabed mining)
		Water
		Power (wind, wave; thermo-chemical)
Non-extractive	Living Marine Resources	Living Marine Resources Non-Consumptive Tourism: Boat Based Whale Watching (BBWW); Shark Cage Diving (SCD), Seabird and Seal colony visits; coral reef diving
	Non-Living Marine Resources	Non-Living Marine Resources Non-Consumptive Tourism: Swimming, Surfing; Boating; Cycling and beach and landscape activities
		Shipping
		Marine Transport & Manufacturing (Ports Infrastructure, ship and boat building)*
		Small harbours *
		Construction – various forms of land reclamation or coastal and offshore platforms
		Under Sea telecommunications Cables
		Atmospheric Carbon Capture & Storage
		Desalination
		Border Control (Immigration & Import Duty Taxation)
	Both	Coastal and Marine Tourism *
Both		Education and Research & Development
		Waste Water and effluent Outfalls
		Marine Protection & Governance *

Since the launch of the Operation Phakisa: Ocean Economy Programme, the Department of Monitoring and Evaluation (DPME) in the Presidency has published the targets and projects for each sub-sector online (DPME: Operation Phakisa, 2018). It also reports on the progress of the various projects intermittently. Progress to date at the end of 2019 could not be determined from the information on the DPME website.

The three original Phakisa industrial sectors (aquaculture, offshore oil and gas, and marine transport and manufacturing) focused their work around development targets. The unlocking or achievement of these targets is supported by a series of projects that must be undertaken over the next 5 to 10 years. A “quick wins” approach was used to identify achievable gains even within a 1 to 2-year period of the first 5 years. Support deliverables across the 5 and 10 year periods included the creation of a supportive policy and regulatory basis in the various sectors; enhancing support agencies; permitting/approvals processes; and the building of major infrastructure such as in ports.

In addition to the three industrial sectors, a fourth sub-sector in the Phakisa Programme is the Marine Protection and Governance sector. The primary objective of this sector is building the governance support mechanisms to implement marine spatial planning towards sustainable and legally compliant ocean use.

The planning of the targets and supporting projects was undertaken in a six-week workshop. Discussions on the four themes were undertaken in parallel sessions or "laboratories." Senior government officials were represented in these sessions, as well representatives of the major industries, civil society organizations, non-governmental organizations, research institutes and universities. These laboratories had periodic visits by the Directors General and Ministers of relevant National Departments, when concepts, targets, challenges and possible solutions were discussed. The President of the country also visited laboratories twice to receive updates on planned work. Subsequent to the initial Operation Phakisa laboratory process of 2014, smaller such "big fast results" interventions were undertaken for Coastal and Marine Tourism in 2016 and for Small Harbours in 2018.

The targets emanating from the Phakisa Ocean Economy planning laboratories are published in several reports to Parliament, and are summarized below from a selection of these reports (DEA, 2014, 2017).

a. Aquaculture

The Aquaculture Phakisa targets included that by 2019:

1) growth in aquaculture production to 20 000 tonnes, 5 times the 2014 production
2) revenue to be at ZAR 3 billion
3) Inclusive growth in aquaculture

4) 15 000 direct jobs and
5) aquaculture sector provides quality jobs, and improves livelihoods in rural communities.

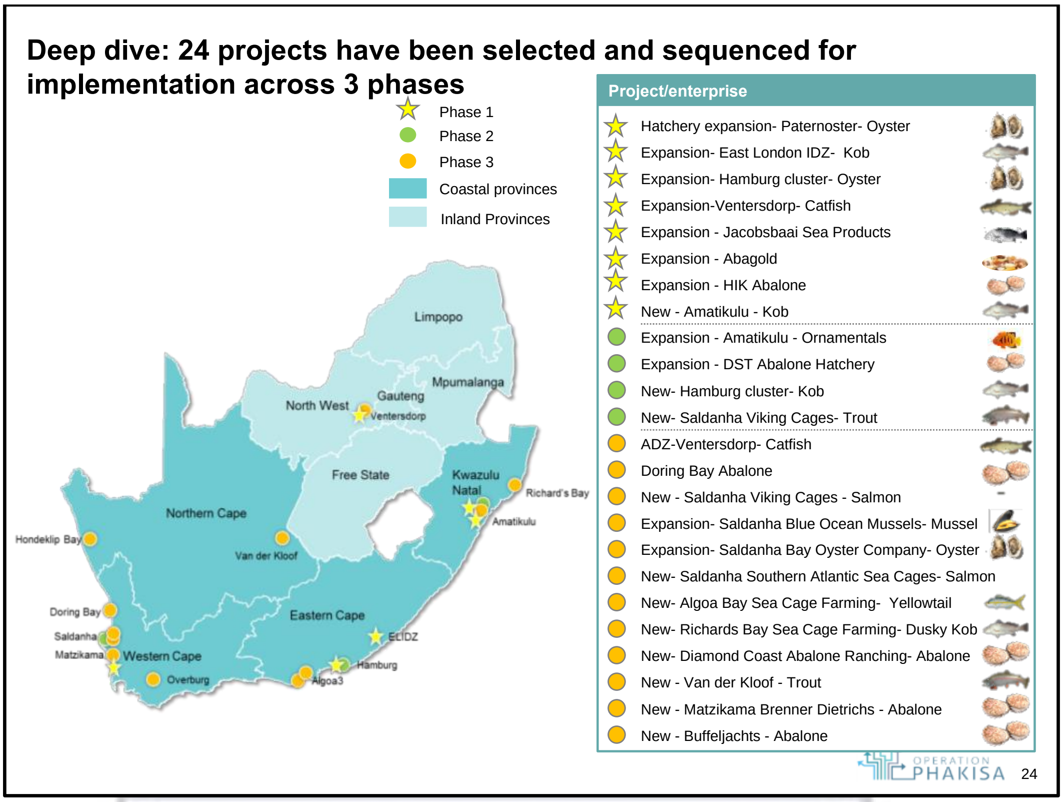

Figure 11. Position of Operation Phakisa Planned Aquaculture Farms (from DEA, 2014).

The planning set out to achieve these targets by establishing or enhancing 24 aquaculture projects over three-time phases. These initial aquaculture farms were identified in all four coastal provinces, including inlands sites and one in an inland province. The positions of these are described in the Figure 11.

b. Offshore Oil and Gas

The Offshore Oil and Gas Phakisa targets were planned over the next ten years from 2014, and included the drilling of 30 exploration wells, through creating an operational and governance environment that promotes exploration. This laboratory also planned its work in three phases across 11 projects, the majority of which are planned to be accomplished by 2019. The mapping of mining interests for oil and gas in the South African ocean is shown in Figure 12, and demonstrates exploration interests to various extents all around South Africa's coastline adjacent to all of the four coastal provinces. The map has a lot of detail and is best viewed on the website reference given in of the caption of Figure 12, which allows for magnification. The map does however show the congestion in mining interests within the South Africa EEZ.

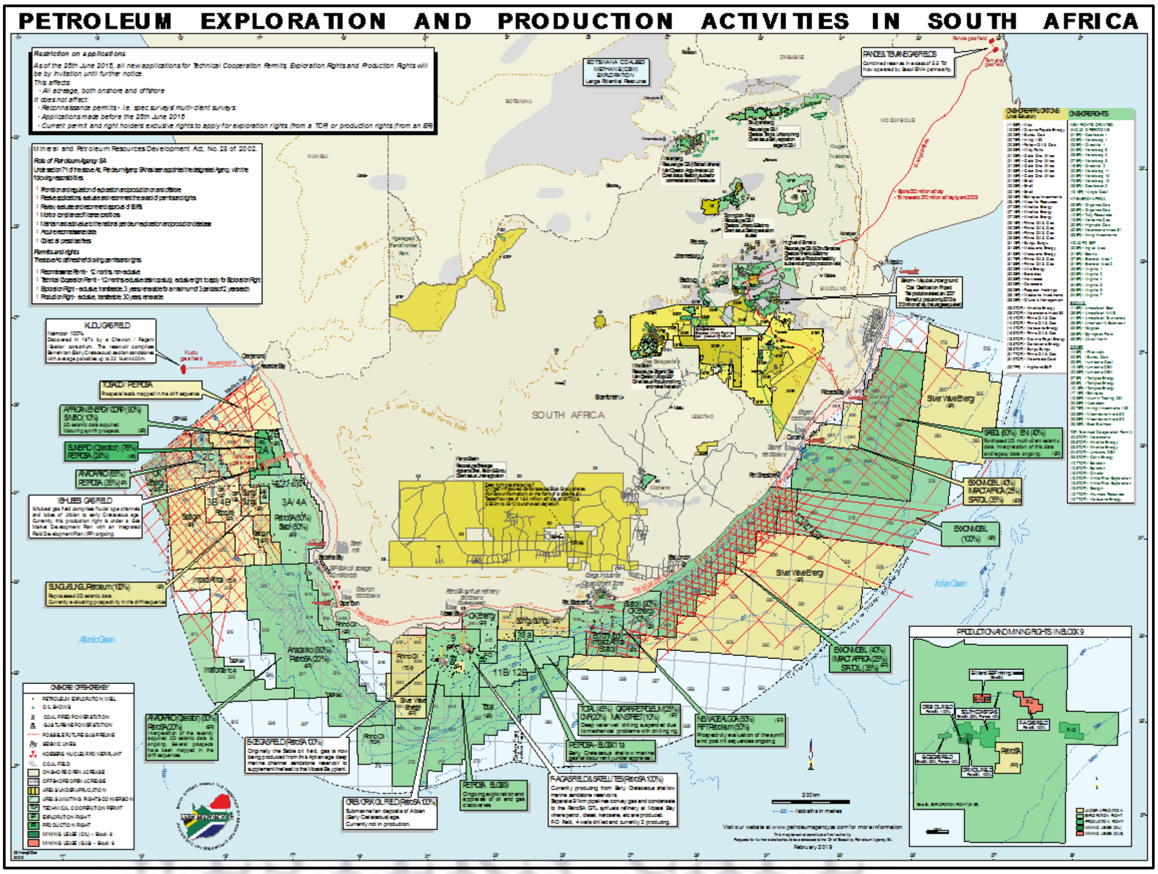

Figure 12. Oil and Gas Interests in South Africa's Ocean Jurisdiction (from Petroleum Agency of South Africa - https://www.petroleumagencysa.com/index.php/maps).

c. Marine Transport and Manufacturing

The Marine Transport and Manufacturing Phakisa targets included that by 2019:

1) There would be an additional R18.8 billion GDP contribution
2) 15 220 additional jobs with an additional 39000-46000 jobs through the employment multiplier effects of associated industries associated with commercial ports.

These were to be accomplished through 18 projects planned between 2016 and 2019. These included a range of training projects, enhancing and building of South Africa's port infrastructure and creating supportive policies. The major investment in Ports would be through Government investment in identified Ports including Saldanha, Richards Bay and East London. South Africa has nine designated commercial ports. Port services range from general cargo handling ports to specialised ports such as iron ore, car and coal shipping in Saldanha, East London and Richards Bay respectively. The nine commercial ports are distributed across the four coastal provinces as shown in Figure 13 which describes the position of the Ports and the sectors that they service. The commercial ports are Port Nolloth, Saldanha, Cape Town, Mossel Bay, Port Elizabeth, Ngqura, East London, Durban and Richards Bay.

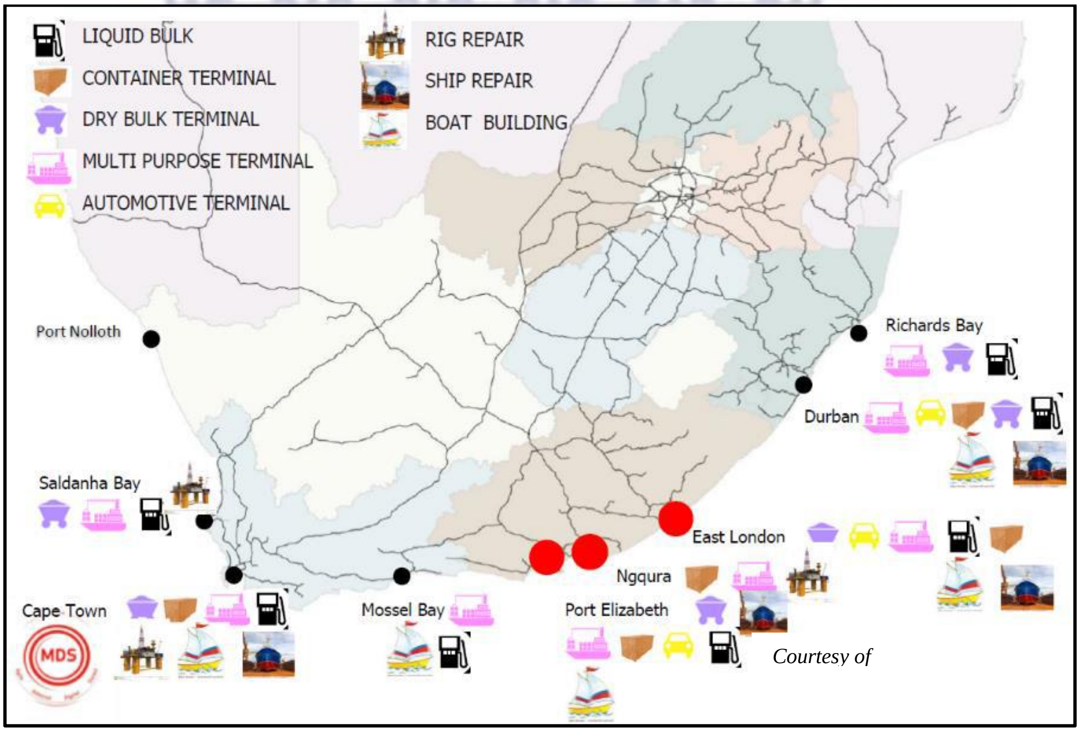

Figure 13. Commercial Ports in South Africa and the Ocean Transport Sectors Serviced (from DEA, 2019a).

Ship traffic is distributed all around South Africa and activity generally follows the commercial specialisations of the Ports. The Ports of the Western Cape Province, in addition to any other service, support the fishing sector together with a collection of smaller proclaimed fishing harbours. Numbers of ships operating around South

Africa range in the thousands annually and include international cargo ships operating between Europe, North and South America and the Eastern countries, including China and India, and to a lesser extent African continental shipping traffic. Figure 14 shows ship distribution off the South African coast compiled by the Oceans and Coast Information Management System (OCIMS-IVT, 2019).

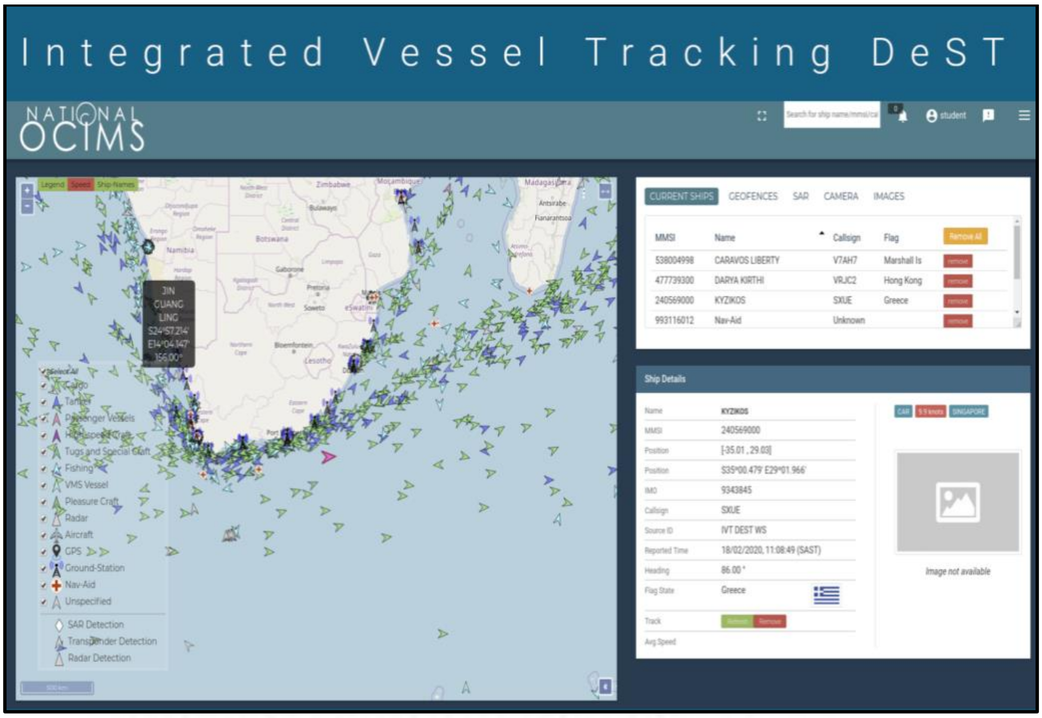

Figure 14. Shipping Traffic Around South Africa Viewed on the Integrated Vessel Tracking Tool of OCIMS (from OCIMS-IVT, 2019, accessed 18 February 2020.)

South African Ports, likes ports around the world, must have their shipping channels maintained. This often means that during maintenance and expansion dredge spoil is dug up from the ocean floor and must be dumped at sea. Dredge dumping sites in South Africa have been historically selected and dumping sites are associated with all the commercial ports. These sites will be an added consideration for MSP in the space outside ports. Dredge dumping permits are issued by the Department of Environmental Affairs.

As a separate and parallel economic development to the Phakisa: Oceans Economy Programme, the South African National Department of Trade and Industry has designated several areas in and adjacent to Ports as Special Economic and Industrial development Zones (SEZs). These SEZs are not exclusive to Ports but are designated at identified areas throughout the country where there are financial incentives offered to business and industry investors towards stimulating economic development. Ports that have associated SEZs are Ngqura, Richards Bay, East London and Saldanha Bay. Additionally, the Dube Tradeport SEZ and the Atlantis SEZ are not directly associated with Ports but do occur in the coastal provinces of Kwazulu-Natal and the Western Cape respectively (DTI, 2018). The economic development imperative may receive higher emphasis in ocean and coastal areas associated with the SEZs.

d. Marine Protection and Governance

This laboratory developed 10 projects to be delivered over the next five years from 2014. The projects covered a wide range of protection and governance initiatives: building capacity for ocean governance through policy and legislation, conservation through establishing marine protected areas, coordinated enforcement across government agencies, assessing water quality, growing ocean observations, including related technologies and developing data management and distribution systems. These data systems were to archive ocean related observation data and disseminate information on status of the ocean environment and report on ocean uses. The data system was also intended to provide decision support tools to support ocean governance and industry sectors. The tenth project in this laboratory is the production of marine spatial plans, with the other projects in this group playing a supportive role in the development of these spatial plans.

The Marine Protection and Governance laboratory included a very defined spatial conservation component in terms of identifying new or extending existing marine protected areas (MPAs). The objective of this project was to reach to 5% of the ocean space declared as MPAs, from the existing base of 0.4%. Work during the Phakisa Laboratory produced an initial set of potential MPAs which were negotiated by the Department of Environmental Affairs with other user National Departments between 2014 and 2018. This was also taken through a public comment process to produce a set of 20 MPAs that was approved by Cabinet for gazetting by the Minister of Environmental Affairs at the end of 2018. The spatial definition of these MPAs are described in Figure 15.

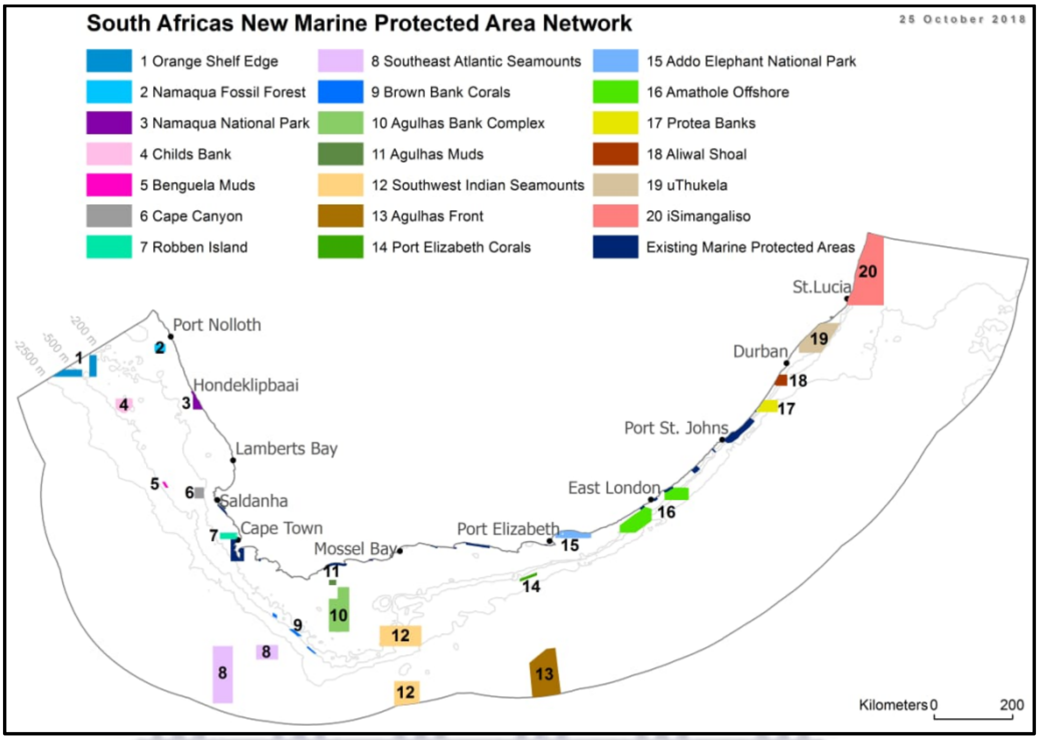

Figure 15. Marine Protected Areas approved by South African the Cabinet in October 2018 (Map released November 18, 2018 at Convention on Biological Diversity, 14th Conference of Parties in Egypt.)

e. Coastal and Marine Tourism

South Africa recognizes two rights based marine tourism sectors: Boat Based Whale Watching (BBWW) and White Shark Cage Diving (WSCD), in addition to a large range of marine and marine wildlife tourism activities (Geldenhuys et al., 2019). Rights in these two sectors are awarded by the Department of Environmental Affairs and can potentially occur in all 4 coastal provinces but are concentrated in the Western Cape. While these sectors employ fewer numbers than the fishing sector or mining sectors with lower cash turnover, they can be important contributors to local economies in the small harbour towns from which they operate. South Africa also has various other active aspects of Marine and Coastal Tourism around the coast, ranging from diving in the warmer waters of the east coast to bird watching all around the coast, including the large aggregations of seabirds that prey on small pelagic fish of the west coast.

The Coastal and Marine Tourism Phakisa took place in the second quarter of 2016 and crafted the overall aspiration of "A world class and sustainable coastal and marine tourism destination that directly benefits South Africans" (Department of Tourism, 2019). Specific 2030 targets that this Phakisa Laboratory included:

1) Growth of the sector contribution to GDP of 9%
2) Increase the number of sector jobs from 52 000 to 116 000
3) Establish a transformed workforce that is representative of South Africa's population race demographics, and specifically includes persons that were previously disadvantaged
4) Sustainability through the conservation for coastal natural resources and meet sustainability indicators and drive conservation

The tourism activities nominated to deliver these targets are wide ranging and spread across coastal and offshore areas. These are described in Figure 16 taken from the Department of Tourism's webpage description of the Phakisa process.

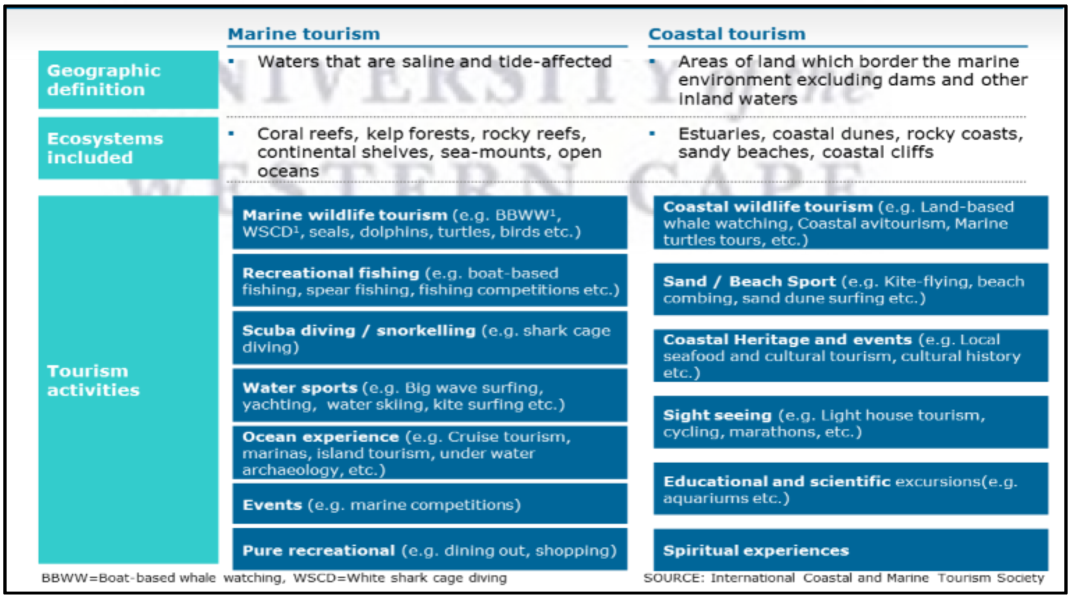

Figure 16. Coastal and Marine Tourism Activities Identified Through the Focused Phakisa Laboratory (from Department of Tourism, 2019).

Emanating from the Coastal and Marine Tourism Phakisa Laboratory, an implementation plan was approved by the South African Cabinet in August 2017. Projects are planned in 6 nodes or clusters (DEA, 2019a):

i. 2 in Province of KwaZulu-Natal – Durban and Surrounds and Umkhanyakude District, including Umhlabuyalingana and surrounds;
ii. 2 in the Eastern Cape Province – Port St. Johns, East London, Port Elizabeth and surrounds;
iii. 1 in the Western Cape Province – Cape Town and surrounds; and
iv. 1 in the Northern Cape Province – West Coast and Surrounds.

The Tourism economic interventions are therefore planned all around the coast, and represents activities around already busy areas such as ports and harbours.

f. Small Harbours

The Small Harbours Phakisa Laboratory was held at the end of 2018. While the final project detail has not been published as yet in early 2020, there are some localities that have been identified for development (DEA, 2019a). The Small Harbour interventions will be focused on the existing 12 Proclaimed fishing Harbours, all situated in the Western Cape Province. These will include and encourage a diversification of business opportunities and supporting enhanced functionality of these small harbours through removal of sunken vessels and dredging to improve access. Various redevelopment activities will be planned for these fishing harbours. Additionally, three new small harbour developments are planned in each of the other coastal provinces: Port Nolloth in the Northern Cape; Port St. Johns in the Eastern Cape and Port Edward in KwaZulu-Natal.

g. Fishing

South Africa has a more than 100-year-old commercial fishery that is primarily directed at marine living resources that are produced in the Benguela upwelling region on the west coast of South Africa (Payne & Lutjeharms, 1997). Species that dominate this sector include the hake bottom trawl (with some diversification into longline and handline subsectors), small pelagic purse seine fishery primarily targeting anchovy and sardine, rock lobster and the line fish fishery comprising various species. Abalone representing a relatively small sector by volume but is a high value species, remains a fishery under severe threat from directed and organised poaching. The major commercial species are fished in the Western and Southern planning areas. The hake and small pelagic fisheries are primarily offshore fisheries while the rock lobster and line fish are primarily relatively inshore.

In addition to the commercial sector, the South African fishery sectors do include a substantial recreational sector (Potts et al., 2019) that supports coastal tourism and a small-scale or subsistence sector in all of the coastal provinces. The sectors target line fish and various inshore and intertidal invertebrate species.

The Department of Agriculture Forestry and Fisheries is at present beginning implementation planning for the Small-Scale Subsistence Fishers Policy which was promulgated in 2014 (Small-Scale Subsistence Fisheries Policy, 2012). This recognizes the rights of small-scale subsistence fishers and the need to formally engage this sector in South Africa. This sector has not previously been formally recognised in the fishing rights allocation processes implemented prior to and post the democratic era in South Africa.

h. Potential Novel Ocean Sectors

Uses that will grow over the next century and decades that are not viewed within the traditional sectors include a range of ocean uses that are emerging in response to step changes in engineering and technology.

While not being entirely new, the growth of the number of undersea cables has increased over the last decades (Bischof et al., 2018). These cables greatly facilitate communication and commerce in the modern world. The track or path of where these cables are laid does mean that these areas are removed from potentially available space for ocean bottom impacting sectors such as mining and bottom fish trawling. Figure 17 describes the placement of undersea cables off South Africa in 2018.

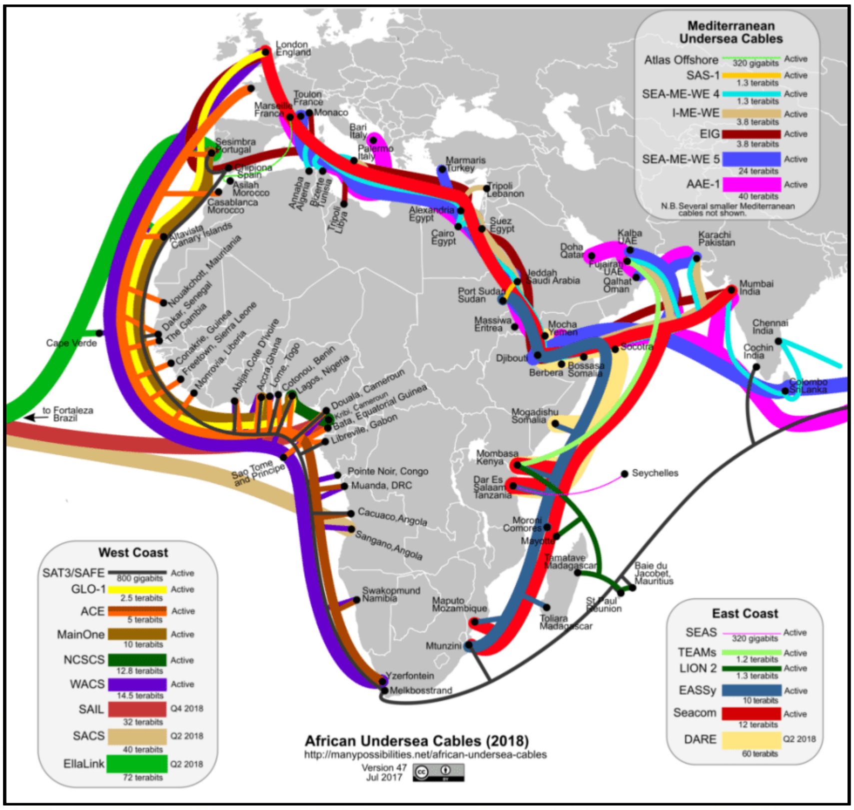

Figure 17. Undersea Cables Sites Around South Africa (from Manypossibilities, 2019)

The storage of captured atmospheric carbon within sub-seabed geological formations has been recognised by the London Dumping Protocol since 2009. Such carbon is recognised as a permittable dumping item, potential significant storage capacity for carbon has been identified in several regions of the world (Goldthorpe, 2017). In South Africa carbon storage sites have been identified on the east, south east and west coasts offshore areas, and in coastal areas of the east and south east coasts (Cloete, 2010; Khoza & Africa, 2012). Figure 18 illustrates potential marine carbon storage sites and is taken from Cloete (2010). Potential sites are determined through the identification of suitable sea bottom geographic composition and structure.

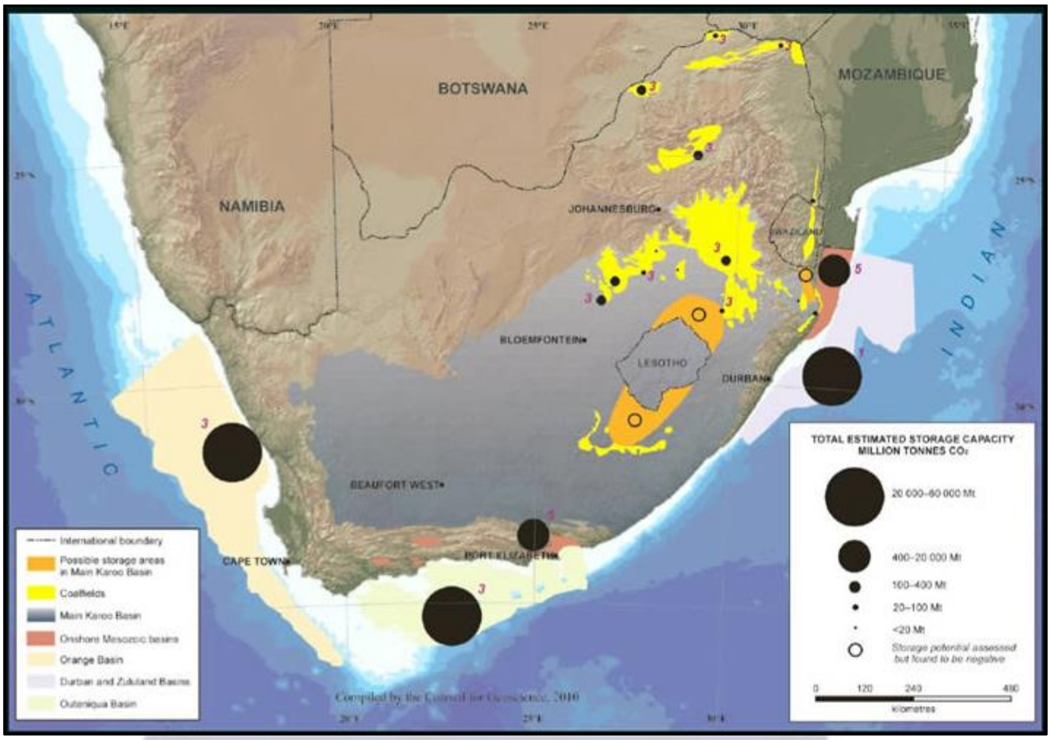

Figure 18. Potential Carbon Storage Sites from Cloete, 2010.
(Storage sites indicated with black circles.)

While not being a novel use, a less well-known use of the offshore environment is the testing of weapons by the Navy and other armed forces (Beck et al., 2018). Any spatial planning exercise must include the Department of Defence, and in particular the Navy, so that any existing and potential South African munitions testing sites, and their schedule may be considered.

Similarly, diamond mining in South Africa has a very long tradition, in excess of 100 years. Marine diamond mining in South Africa is well documented (McKechnie, 2019) and occurs mainly of the west coast of South Africa, closer to the Namibian border and around the Orange River mouth. While marine diamond mining in South Africa is long established, phosphate mining is emerging as a new offshore mineral mining resource. Post 2010, South Africa’s Department of Mineral resources has processed and awarded three mining rights for phosphate in the West Coast and South East Coast offshore areas, illustrated in Figure 19. The figure is from the non-governmental organisation Safeguard Our Seabed factsheets. These permits are as yet not activated for various reasons including that phosphate mining has received some strong opposition from the fishing and environmental conservation sectors (Safeguard Our Seabed, 2018).

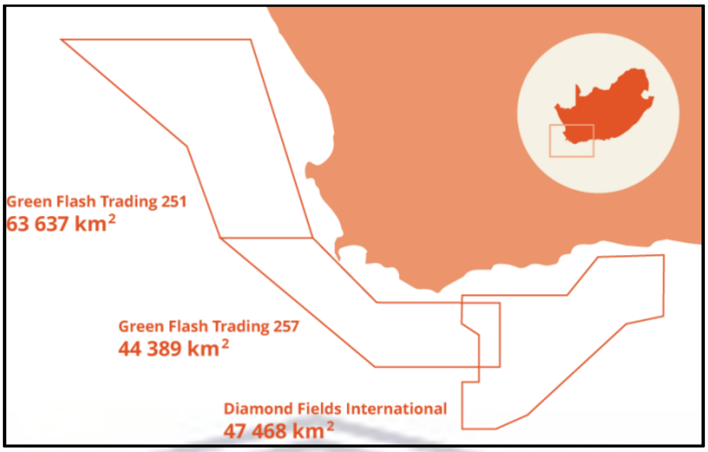

Figure 19. Offshore Phosphate Mining prospecting Rights Awarded in South African EEZ (from Safeguard Our Seabed, 2018). (Rights Area indicated in polygons.)

South Africa is classified as a semi-arid country and in recent times has experienced drought conditions on the Indian and Atlantic halves of the country. There has been a growth of desalination plants around the country, with existing or planned projects in all the coastal provinces (Patel, 2018). These are generally permitted through an Environmental Impact Assessment exercise by the Department of Environmental Affairs. While a coastal activity, desalination plants will have to be considered when planning the placement of other sectors that may impact on water quality.

An undervalued use of the coastal ocean in developing countries, which is also true for South Africa, is the use of the ocean for disposal of domestic and industrial waste water and effluent. This is certainly not a novel use, and must have a history as long as human settlements have taken place along the coast. It is included here in the novel use discussion, as this study proposes that this use is established as a use category. Effluent disposal has significant cumulative impact on environmental functioning and potentially on other sectors that rely on good environmental quality or marine living resources. The Department of Environmental Affairs permits these outfall pipelines into the coastal area. Waste water effluent pipeline sites occur in all coastal provinces at present, and are associated with coastal villages, towns, cities and industrial zones.

Coastal wind energy has grown substantially over the last decade and is primarily based in the provinces of the North West, Western cape and Eastern Cape. Existing and planned wind farm projects as at March 2016 are illustrated in Figure 20, replicated from Mybroadband – Trusted in Tech e-magazine.

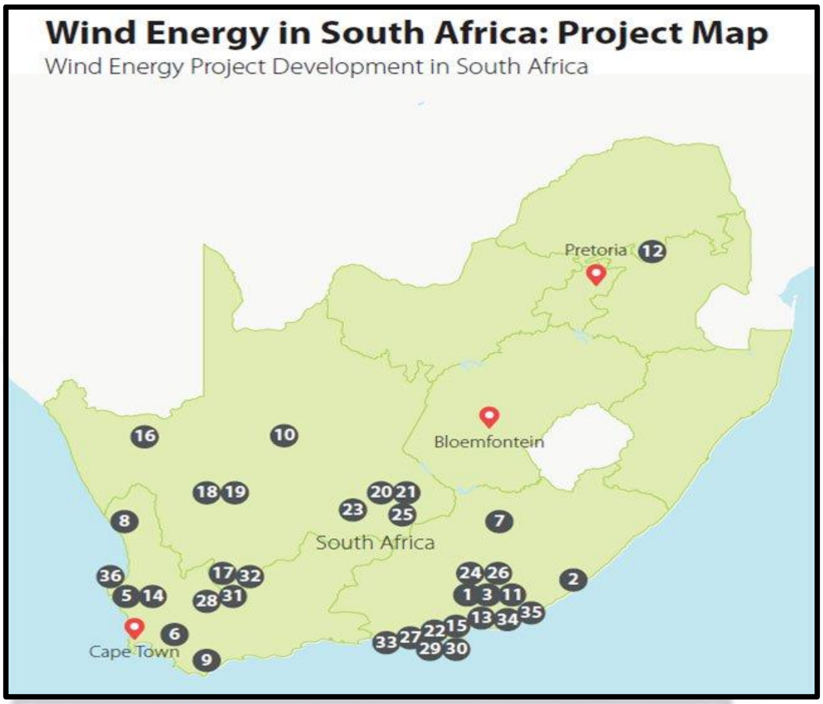

Figure 20. Location of existing and planned wind farms around South Africa (from Mybroadband - Trusted in Tech, 2016).

An emerging consideration for the spatial planning must also include the many shipwrecks around South Africa. These sites are documented by the South African Heritage Resources Agency (SAHRA, 2018). Heritage sites also occur on coastal land areas and include historic colonial and precolonial sites such as early human settlements. These sites have high societal value and will therefore need to be included in MSP.

6.4. Ocean Industry Sectors in the Four Marine Spatial Planning Areas

The White Paper on the National Environmental Management of the Ocean describes marine spatial planning to occur in four areas, the West Coast, the South East Coast, East Coast and the Prince Edward Islands - two small sub-Antarctic islands that South Africa claimed in 1949 (NEMO, 2014). This section will describe the ocean industry sectors that are either active or potentially active in each of the four planning areas. Notably the draft Marine Spatial Planning Bill does not refer to these areas specifically but only refers to term "marine areas" as the unit for which a marine area plan is developed (Marine Spatial Planning Bill, 2017). The four planning areas are also not defined in the MSP Act (MSPA, 2019) but are defined in the subsequent draft Approach to Marine Spatial Planning In South Africa (2019), and is replicated here in Figure 21. The Marine Planning Areas do not follow the land provincial borders. The Northern Cape and most of the Western Cape Province are combined to form the Western Marine Planning Area. The remainder of the Western Cape and the majority of the Eastern Cape Province is identified as the Southern Marine Planning Area. This leaves the remainder of the Eastern Cape Province and the entire KwaZulu-Natal Province as the Eastern Planning Area. The Prince Edward Islands Marine are designated as the fourth planning area.

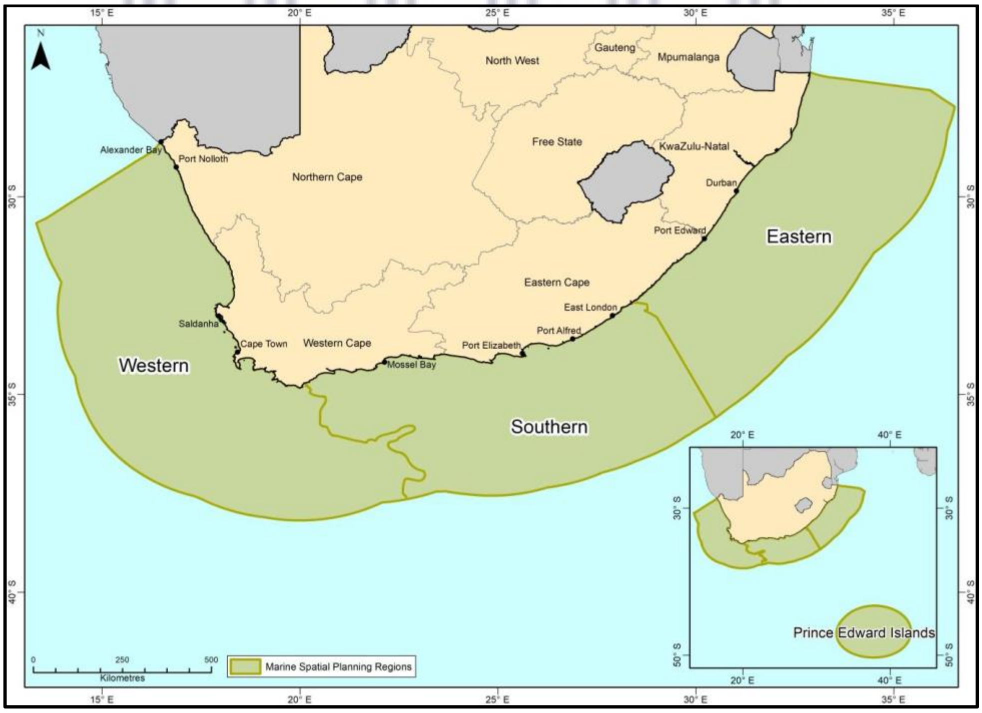

Figure 21. The Four Marine Planning Areas of South Africa (from Marine Spatial Planning Approach, 2019)

6.4.1. The Western Marine Planning Area

This is the busiest planning area in terms of the number of active sectors and in particular presents fisheries activities across the small-scale, recreational and commercial nodes. The large-volume industrial fisheries are located on South Africa's west coast. This is as a result of the west coast being influenced by ocean upwelling. Upwelling ocean areas are generally rich in nutrients that sustain large biomass volumes throughout the food chain. The west coast forms part of the Benguela Large Marine Ecosystem which is shared with Namibia and southern Angola.

The fishery-rich west coast is also home to significant small-scale subsistence fishers and recreational fishers that target various line fish species, rock lobster and other coastal invertebrates, including abalone. Abalone remains the primary targeted species for the aquaculture industry in this region, and is the most stable of aquaculture industries. In South Africa these farms sometimes share an investment association with the large commercial fishing rights holders.

The fishing sectors are supported by the 12 proclaimed fishing harbours and four commercial Ports in the Northern Cape and Western Cape Provinces: Port Nolloth; Saldanha; Cape Town and Mossel Bay. Additionally, the South Africa's only dedicated Naval Harbour is in the Western Cape in Simonstown. The division of the Marine Planning Areas places the Mossel Bay Port in the Southern Planning Area. Mossel Bay, which is found close to the provincial border of Western and Eastern Cape land provinces, is the site of South Africa's only active offshore gas exploitation operation, which works with a processing plant based on the outskirts of the Mossel Bay municipality. These activities will have to be noted as inputs in the Southern Marine Planning Area.

The commercial ports of the Northern and Western Cape have focused activities. Saldanha is the primary iron ore port facility in the country with a section of the port also supporting the more industrial offshore fishing industry and inshore and small-scale fishers that operate smaller vessels. The Port of Cape Town focuses on tourism, fishing and cargo handling, including the export of fresh fruit from the Cape agricultural area, while Mossel Bay supports fishing and cargo handling. Port activities are described in Figure 13, which illustrates all the ports of South Africa and their primary activities.

The west coast of South Africa is also famous as a diamond mining area especially around the Orange River estuary. Over the last few decades exploration for oil and gas has also occurred in this region. The most recent mining discussion on west coast has been centred on phosphate mining, which is also a product of the rich nutrient cycling of a system that experiences ocean upwelling. Existing phosphate mining applications and activity are illustrated in Figure 19.

Coastal wind farming has emerged on the west coast to take advantage of the consistent winds that drive the upwelling (Pullinger, 2018; SAWEA, 2019). At present all of the wind generation in South Africa is coastal with no offshore units operational. Coastal wind farms interact with other coastal activities such coastal tourism, and impacts on aspects of biodiversity. In particular non-governmental conservation activist groups like the World Wildlife Fund and Birdlife International raise concerns on the interaction with coastal birds (Ralston Paton et al., 2017).

The nutrient rich water allows for high levels of primary production and fish stocks. These support a variety of large numbers of top predators including seabirds, seals, sharks, whales and dolphins. The colder waters also provide some unique habitats. Consequently, a number of areas have been identified as ecological and biological significant areas and have been included as Marine Protected Areas. The Marine Protected Areas are illustrated in Figure 15. Table 10 describes a more complete set of ocean sectors of the Western Planning Area and the inputs associated with each of these.

6.4.2. The Southern Marine Planning Area

The Southern Marine Planning Area lies adjacent to the Eastern Cape land province primarily but also shares coasts of the Western Cape and Kwa-Zulu Provinces. The Eastern Cape Province lies between the Western Cape and KwaZulu-Natal Provinces and its ocean and coastal areas share attributes with the colder, upwelling driven ecosystem of the west coast and the warmer Agulhas Current driven system of the east coast. Like the Western Planning Area, the Southern Planning Area supports a range of fisheries including recreational, small-scale and large commercial fisheries. The "intermediate" habitat of the Southern Planning Area allows for the aquaculture industry to target a larger range of species that include abalone, prawn and line fish.

The Commercial Ports in the Eastern Cape Province are Port Elizabeth, East London and Ngqura. Port Elizabeth, in addition to other commercial port services such as cargo handling, has a focus on motor vehicle shipping. The region has a long history of vehicle manufacture. The Port of Mossel Bay, including the offshore gas production facility although located in the Western Cape Province, has been included in the Southern Marine Planning Area.

The Port of Ngqura is South Africa's newest port and has been built over the last two decades. It is significant as it is a purpose-built deep-water port and is intended to stimulate the economy of the Eastern Cape.

There has been some interest in the Eastern Cape Area in oil and gas exploration, and this is evident in Figure 12 which maps the offshore oil and gas interests. The French company TOTAL announced in early in 2019 that it will be proceeding to the exploration of a potential find (Engineering News, 2019).
Alternate energy in the form of coastal and inland wind farms have also been developed the Eastern Cape Province, which like the west coast has strong wind profiles.

The intermediate ecosystems of this area between the east and west coasts provides for a richly biodiverse system, supporting top predator species and a wide range of invertebrates and fish. Most of South Africa's estuaries are also found in this region, and include other niche habitats and breeding grounds for several species (Sink et al., 2012). The Southern Planning Area therefore supports a wide range of marine ecotourism activities, although with fewer Boat Based Whaling Watching and Shark Cage Diving activities compared to the Western Planning Area. Table 11 describes a more complete set of ocean sectors of the Southern Planning Area and the inputs associated with each of these.

6.4.3. The Eastern Marine Planning Area

The Agulhas Current is dominant environmental feature of the east coast marine spatial planning area and is the primary driver of the physical attributes of the region, and the resulting biodiversity. The Eastern Marine Planning Area is primarily adjacent to the KwaZulu-Natal land province and does not support the large-volume fish stocks and commercial fisheries of the west coast. This region does support a wide range of sub-tropical species which are at the further distribution extents of the warmer habitat types, extending away from the equator. Several of the planned Marine Protected Areas within the Southern and Eastern Planning Areas have a coastal land component. Most of the completely offshore protected areas occur in the Western Planning Area. Access (and its limitation) to coastal areas and resources in Marine Protected Areas for local communities and inshore industry sectors is therefore a consideration in marine spatial planning in the Southern and Eastern Planning Areas, see Figure 15 for MPA locations.

The Ports of Durban and Richards Bay occur in this region. Durban is the busiest of South Africa's ports in terms of cargo handling. The Port of Richards Bay is a specialised bulk coal handling port, servicing the coal export industries (South African National Ports Authority, 2019).

As with the other marine planning areas, there is some exploration for offshore oil and gas, however coastal wind energy generation is not present in this area. While aquaculture farms do exist in the east coast, there are fewer than those of the south and west coasts. Table 12 describes a more complete set of ocean sectors of the Eastern Planning area and the inputs associated with each of these.

6.4.4. The Prince Edward Islands Marine Planning Area

The Prince Edward and Marion islands are collectively called the Prince Edward Islands and represent South Africa's least busy planning area in terms of active industrial sectors. South Africa does operate a year-round research base on the larger of the two islands: Marion Island, which can accommodate about 24 people during the year. However, this number can triple during the annual research team changeover. The changeover currently takes place between April and May when the South African research ship, the *SA Agulhas II* voyages to the Island. Several other research teams use this changeover opportunity to visit the island. Oceanographic research and sampling is undertaken while the ship is sailing to and from the Island. Fishing is the only active industrial sector in this area, and comprises a very limited operation targeted at Patagonian Toothfish. Figure 22 illustrates sub-Antarctic toothfish fishery, as described on the webpages of the Coalition of Legal Toothfish Operators (2018). Table 13 describes the ocean sectors and their inputs for the Southern Planning Area.

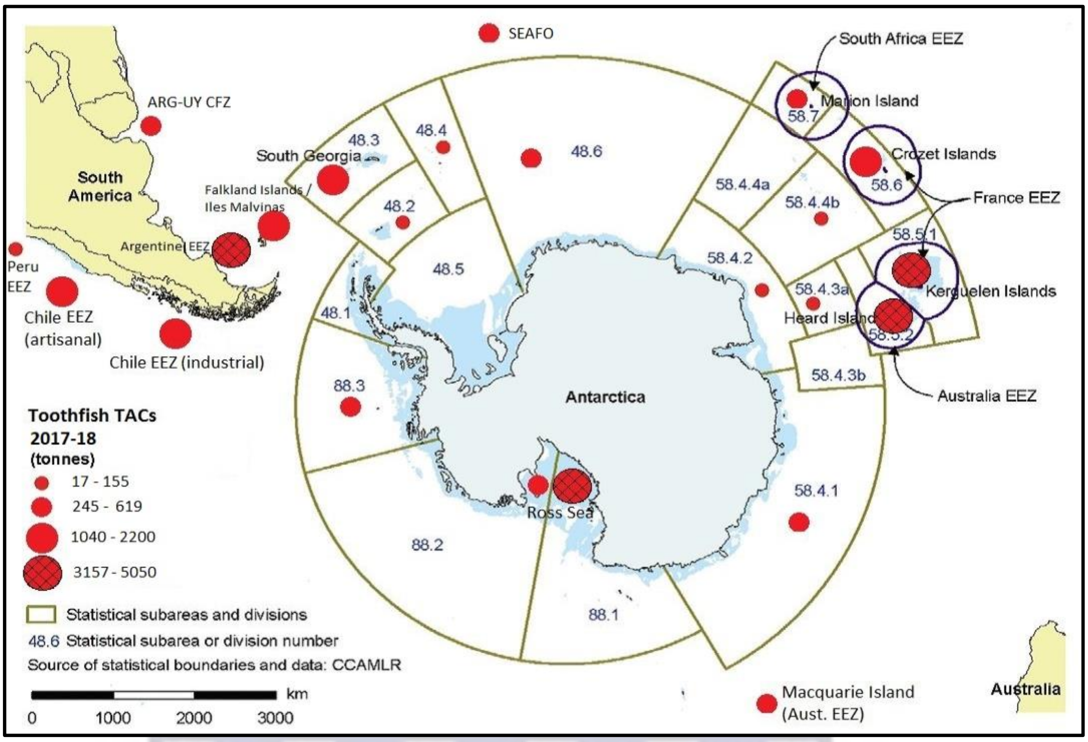

Figure 22. Toothfish Total Allowable Catches by Tonnes (from Coalition of Legal Toothfish Operators, 2018)

Table 10. Inputs for Ocean Sectors in the Western Marine Planning Area (Inputs in Rows and Sectors in Columns)

Inputs/Sector	Offshore Fishing	Coastal Fishing /Inshore	Sub-sistence Small-scale Fishers	Aqua-culture	Oil & Gas Min-ing	Crude Oil Proces sing	Seabed Mining	Phos-phate Mining	Ship-ping	Port Services	Fishing Harbours	Waste Water /Effluent Pipelines/ Desalin-ation	Under Sea Cables	Wind Farms – Coastal	Coastal Tourism	Boat Based Whale Watch-ing	White Shark Cage Diving	Marine Protected Areas/ Heritage Sites	Education & Science
Ocean Space – Surface	x	x	x	x	x	x	x		x	x		x			x			x	x
Ocean Space – Midwater	x							x				x						x	x
Ocean Space – Sea floor	x				x			x		x		x	x					x	x
Biological Resources	x	x	x					x				x	x	x		x	x	x	x
Physical Resources					x			x	x	x		x		x					x
Aesthetic, Cultural Resources & Access	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x
Labour	x	x	x	x	x	x	x	x	x	x	x				x	x	x		
Fuel	x	x	x					x	x	x	x					x	x		
Port Infrastructure	x	x		x	x	x	x	x	x	x	x				x	x	x	x	x
Other Infrastructure	x			x	x	x	x	x	x	x	x	x		x	x	x	x		x
Vessels	x	x			x			x	x	x	x								x
Chemical/ Effluent/ Nutrient Disposal				x	x	x	x	x	x	x	x	x							

Table 11. Inputs for Ocean Sectors in the Southern Planning Area (Inputs in rows and sectors in columns)

Inputs/Sector	Offshore Fishing	Coastal Fishing /Inshore	Subsistence Small-scale Fishers	Aqua-culture	Oil & Gas Mining	Gas Processing	Phosphate Mining	Shipping	Port Services	Fishing Harbours	Waste Water/ Effluent Pipelines/ Desalination	Under Sea Cables	Wind Farms – Coastal	Coastal Tourism	Boat Based Whale Watching	White Shark Cage Diving	Marine Protected Areas/ Heritage Sites	Education & Science
Ocean Space – Surface	x	x	x	x	x	x		x	x		x			x			x	x
Ocean Space – Midwater	x						x				x						x	x
Ocean Space – Sea floor	x				x		x		x		x	x					x	x
Biological Resources	x	x	x				x				x	x	x		x	x	x	x
Physical Resources					x		x	x	x		x		x					x
Aesthetic, Cultural Resources & Access	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x
Labour	x	x	x	x	x	x	x	x	x	x				x	x	x		
Fuel	x	x	x				x	x	x	x					x	x		
Port Infrastructure	x	x		x	x	x	x	x	x	x				x	x	x	x	x
Other Infrastructure	x			x	x	x	x	x	x	x	x		x	x	x	x		x
Vessels	x	x			x		x	x	x	x								x
Chemical/ Effluent/ Nutrient Disposal				x	x	x	x	x	x	x	x							

Table 12. Inputs for Ocean Sectors in the Eastern Planning area (Inputs in rows and sectors in columns)

Inputs/Sector	Offshore Fishing	Coastal Fishing /Inshore	Subsistence Small-Scale Fishers	Aqua-culture	Oil & Gas Mining	Crude Oil Processing	Seabed Mining	Phosphate Mining	Shipping	Port Services	Fishing Harbours	Waste Water/ Effluent Pipelines/ Desalination	Under Sea Cables	Wind Farms – Coastal	Coastal Tourism	Boat Based Whale Watching	White Shark Cage Diving	Marine Protected Areas/ Heritage Sites	Edu-cation & Science
Ocean Space –Surface	X	X	X	X	X	X	X		X	X		X			X			X	X
Ocean Space –Midwater	X							X				X						X	X
Ocean Space – Sea floor	X				X			X		X		X	X					X	X
Biological Resources	X	X	X					X				X	X	X		X	X	X	X
Physical Resources					X			X	X	X		X		X					X
Aesthetic, Cultural Resources & Access	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Labour	X	X	X	X	X	X	X	X	X	X	X				X	X	X		
Fuel	X	X	X					X	X	X	X					X	X		
Port Infrastructure	X	X		X	X	X	X	X	X	X	X				X	X	X	X	X
Other Infrastructure	X			X	X	X	X	X	X	X	X	X		X	X	X	X		X
Vessels	X	X			X			X	X	X	X								X
Chemical/ Effluent/ Nutrient Disposal				X	X	X	X	X	X	X	X	X							

Table 13. Inputs for Ocean Sectors around Prince Edw
Planning Area (Inputs in rows and sectors in columns)

Inputs/Sector	Offshore Fishing	Marine Protected Areas/ Heritage Sites	Education & Science
Ocean Space - Surface	x	x	x
Ocean Space - Midwater	x	x	x
Ocean Space - Sea floor	x	x	x
Biological Resources	x	x	x
Physical Resources			x
Aesthetic, Cultural Resources & Access	x	x	x
Labour	x		
Fuel	x		
Port Infrastructure	x	x	x
Other Infrastructure	x		x
Vessels	x		x
Chemical/ Effluent/ Nutrient Disposal	x		x

6.5. South African Ocean Sector Interactions

The White Paper on the National Environmental Management Policy of South Africa - NEMO (NEMO, 2014) offers marine spatial planning as a mechanism to provide guidance on the uses of ocean spaces in the South African EEZ. It envisages four major areas for marine spatial planning: the Western; Southern Eastern; and the Prince Edward and Marion Islands. The Marine Planning Areas are defined in the draft Approach to Marine Spatial Planning that was published for comment by the Department of Environmental Affairs in August 2019.

The four marine spatial planning areas are useful to describe the various activities that will require spatial management. Potential and existing ocean uses in South Africa are described in Section 6.3 above. The activities in each of these areas and the inputs that they will require are described in section 6.4 above. Requiring similar inputs may result in competition or complementarity across sectors. Some inputs like labour or port infrastructure and services could serve to promote the co-location of sectors that require these. Co-location may not be easily achieved if two more sectors required inputs such as physical space on the sea floor or access to same fish aggregations. In each of these areas there will be a different combination of opportunities and pressures to consider, as each ocean sector will interact with every other sector. For instance, investment in Port and Shipping Infrastructure is beneficial to fishing, commercial shipping and the offshore oil and gas sector. While effluent pipelines and aquaculture will be at odds if they occur at the same location as the poor water quality from the effluent pipeline will damage quality of fish production. Consideration must also be given as to how these opportunities and pressures will change over time and how this will influence the dynamics of time accumulated and space aggregated impacts. When considering accumulated and aggregated impacts, the influences of one sector on another or multiple sectors on the environment may or not be linear, adding to the complexity of MSP.

The NEMO policy requires the management of accumulated and aggregated impact and argues that through spatial planning and ecosystem-based management, the integrity of the marine ecosystems must be protected and maintained or enhanced. Maintaining the integrity of marine ecosystems may be considered a boundary condition for MSP in South Africa.

Table 14 shows the interaction across ocean sectors using the classification offered by Klinger et al., 2018. The allocation of this categorization is not universal and will depend on a subjective interpretation of the interaction across sectors. The researcher/student's rationale for the allocation of categories in the Table 14 is discussed below the Table and was informed by the interviewee's opinions, the literature reviewed in previous chapters and personal experience. The review of existing and novel ocean uses and the illustration of the inputs required across the various ocean sectors in each of the four planning areas in Sections 6.3 and 6.4 form the basis for the discussions below on marine spatial planning considerations.

In undertaking this exercise, the subjective nature of the categorization became increasingly apparent and often the same relationship between sectors can be argued as being either positive or negative depending on opinion and strategic perspective. In reality these interactions will be very much coloured by specific contexts.

The interactions of the first four sectors listed in Table 14 are discussed in detail only. The first four sectors are selected for discussion as the considerations in these provide for similar types of interactions across the other sectors. Possible decision criteria and considerations for MSP are described after the detail discussion of interactions. The Legend for the colour codes used in Table 14 is illustrated as:

Key: Types of Interaction		
Competition		negative/negative
Antagonism		positive/negative
Amensalism		negative/zero
Commensalism		positive/zero
Mutualism		positive/positive

The definitions for each type of interaction has been provided in the Research Methods Section of this Chapter, Section 6.2 (Table 8) and follow the definitions offered by Klinger et al., 2018.

The Approach to Marine Spatial Panning (2019) published by the department of Environmental Affairs proposed a nested zonation within the marine planning to allow for planning areas to accommodate primary uses or sectors that meet the objective of the zoning. Once the primary sectors are established secondary sectors can then be allowed in the area if these do not negatively impact the primary zonation objective. The zonation and determination of additional sectors will be context specific and will have to involve, at some point, a discussion that approximates the categories of interactions in Table 14.

Table 14. Categorization of Relationships Across Active Ocean Sectors in South Africa

Sector	Off-shore Fishing	Coastal Fishing / Inshore	Subsist-ence Small-Scale Fishers	Aqua-culture	Oil & Gas Mining	Crude Oil / Gas Pro-cessing	Seabed Mining	Phos-phate Mining	Ship-ping	Port Services	Fishing Harbours	Waste Water/ Effluent Pipelines/ Desali-nation	Under Sea Cables	Wind Farms-Coastal	Coastal Tourism	Boat Based Whale Watch-ing	White Shark Cage Diving	Marine Protected Areas/ Heritage Sites	Educ-ation & Science
Offshore Fishing																			
Coastal Fishing / Inshore																			
Subsistence/Small - Scale Fishers																			
Aquaculture																			
Oil & Gas Mining																			
Crude Oil / Gas Processing																			
Seabed Mining																			
Phosphate Mining																			
Shipping																			
Port Services																			
Fishing Harbours																			
Waste Water / Effluent Pipelines/ Desalination																			
Under Sea Cables																			
Wind Farms – Coastal																			
Coastal Tourism																			
Boat Based Whale Watching																			
White Shark Cage Diving																			
Marine Protected Areas/ Heritage Sites																			
Education & Science																			

6.5.1. Offshore Fishing can be argued as competing with inshore fisheries. Both of these sectors are likely to be targeting the same species and stocks in the overlapping ocean space that they occupy. This overlapping ocean will be in the initial fishing space of the offshore fisheries before the fleet moves into further and deeper waters. Subsistence fishers generally target inshore species, and therefore would not be seen to be impacted by offshore deep ocean fisheries. However, on the west coast, small-scale subsistence fishermen do use small boats to access deeper water species such as snoek (*Thrysites atun*) and yellowtail (*Seriola lalandi*). These species are also taken by some offshore fishers, including as by-catch. In this situation small-scale subsistence fishers are impacted negatively with little or no impact on the offshore industry, making this relationship one of amensalism.

The aquaculture industry and the offshore fishing industry could benefit from each other in marketing the region as offering a diverse set of fish and fish products, essentially by building the brand of the region as a supplier of quality wild and farmed product. Offshore oil and gas mining, including exploration activities compete for ocean space with offshore fishing. While both of these activities use the water column, the competition is also centred around the use of the ocean floor. Potential conflicts across oil and gas mining operations and fisheries sectors are well documented (Olsen et al., 2016). Oil and gas processing may however also have a positive influence on the offshore industry as a local supply of fuel, reducing the cost of fuel, a major cost driver, to this industry. The oil and gas processing industries are largely unaffected by the offshore fishing industry, even though this industry is a direct market for the oil processing product. It is unlikely that the demand from this sector is a major percentage of the oil sales, categorizing this relationship as commensal. A competitive relationship exists between offshore trawl fishing and seabed mining which uses the ocean floor space, including phosphate mining. Besides impacting the ocean floor, mineral mining processing activities may also impact the water column as is the case with phosphate where mining spoil is released back into the water column. This adds large amounts of particulate matter to the water column which will impact negatively on primary production and plankton survival, including the early life stages of fish. Shipping routes displace offshore fishing activities, so this relationship is also competitive. Although, one could also define this relationship as being commensal, as the offshore fishing industry can benefit from having the shipping industry to transport their product to foreign markets, while the offshore fishing sectors generally have to give way to established shipping routes. The shipping industry is therefore largely unaffected. Offshore fishing, ports services and fishing harbours enjoy a mutualistic relationship in terms of supply and demand of support industries to this fishing sector. The interaction with effluent pipelines is categorized as antagonistic because marketing fish product from harbours or ocean areas that are perceived as polluted is difficult, however port based fish processing plants used by offshore fisheries require such effluent pipeline services. This places an extra burden on the placement and management of effluent pipelines, while the fish processing sectors benefit from the waste services, their perceived polluting impact is unwelcome.

Like other activities that compete for ocean floor space, undersea cables and the offshore fishing sector have a competitive relationship. Wind farms can be regarded as having a positive influence on the offshore sector, as these supply alternate sources of electricity to the land-based fishery support industries and processing plants. In addition to being perceived as environmentally friendly energy production, alternate energy sources in South Africa are becoming more important as the supply of electricity from coal-fired plants has become unstable. Daily interruptions in supply have been experienced periodically over the last 5 years, a situation known as electricity demand load shedding. Wind farms add to the sustainability and responsible environmental management concepts associated with the region, and this may be translated to markets viewing the offshore and other fish sectors positively. South Africa has announced its Integrated Resource Plan for energy generation in October 2019. This final version has seen the proposed energy production from wind increase from 13% in the initial draft to 18% in the October 2019 version (Wasserman & Omarjee, 2019). This is an attempt to address the unstable energy production and reduce the carbon emissions from South Africa's coal fired energy plants. On implementation this will see increases in coastal wind production, resulting in increased competition for space in the coastal zone.

Coastal Tourism enhances the region's brand association with ocean products, and visiting tourists will view the consumption of ocean products as part of the tourist experience. More pragmatically, boat-based whale watching and shark cage diving can also be viewed to be competitive with offshore fishing as vessels compete for ocean space. Great White Shark cage diving hotspots in South Africa occur in the Western Planning Area in Gansbaai and False Bay. These areas overlap with the demersal long line fishing operations that include other smaller shark species such as soupfin and smoothhound (Bitalo et al., 2015; Pinnock, 2020). The absence of great White Sharks in the Western Cape has been very topical over 2019, and has pitched the shark cage diving operations and the demersal long line fishery at each other (Sguazzin, 2019). Similarly, the whale watching industry raise concerns that there in an increasing number of whales being caught in rock lobster and octopus fishing gear. The Minister of Environmental Affairs briefly closed the octopus fishery in 2019 because of whales being caught and killed in the anchor ropes of the octopus fishery (Evans, 2019).

Marine protected areas are in competition with offshore fishing for ocean space, as generally in South Africa offshore fishing is excluded as a use in protected areas. One such example of conflict between fishing and protected areas or conservation in South Africa, is around the closure of fishing grounds around islands that are used by the African penguin (*Spheniscus demersus)* as foraging sites. African Penguins breed on Dassen, Robben, St. Croix and Bird Island on South Africa's west and south east coasts. Experimental closure to small pelagic fisheries in penguin feeding areas around such islands have shown benefit to breeding success of penguins (Sherley et al., 2018). These penguins have shown a marked decline in population numbers over the last century, and in particular over the last two decades. On account of the large decrease in its numbers, the African Penguin is now classified as endangered in terms of criteria of the International Union for the Conservation of Nature (IUCN). Successful negotiation with the small pelagic industry for permanent closure of the fishery around penguin breeding islands has not as yet been completed. Considerations for MSP here will have to weigh the relative return to the fishing industry from these fishing grounds around bird inhabited islands, to that of breeding success and positive impact on population recovery of vulnerable bird species. The boundary condition of the NEMO White Paper of maintaining ecosystem integrity could motivate that, in this debate, providing support to the African Penguin is the imperative, especially if the small pelagic catches around the islands do not make up large percentages of the total catch.

It could be argued, albeit case and species specific, that Marine Protected Areas (MPAs) offer places of refuge for breeding stocks of targeted fish species, and the spawning products within MPAs will benefit fished areas (Sink, 2016; Harris & Lombard, 2018). With this perspective, the relationship between offshore fishing and MPAs will be categorized as commensal, with the fishing sector benefitting and the protected areas not being affected. Decreasing impact and disturbance in the MPAs can also be viewed as been a positive "impact" on the MPA. A positive view of MPAs by the fishing sector, especially the small-scale sector is however not the norm in South Africa (Sunde & Isaacs, 2008; Sowman & Sunde, 2018). Marine protected areas are often viewed by this sector as limiting access to marine resources.

In this study, education and science initiatives are always viewed as having a mutualistic relationship with the various ocean sectors. Ocean sectors provide opportunity for science and education programmes, and in return these programmes enhance the sectors through improving the knowledge and technology platforms. A different view is that these programmes do often take place in South African marine protected areas and as such they are the major source of impact in otherwise pristine and unimpacted areas. Viewed in this way, the relationship will be antagonist where science and education benefit and the ocean spaces are negatively impacted (Hubert, 2011). This is especially true for the relatively undisturbed coast and ocean of the Prince Edward Islands.

6.5.2. Inshore and Coastal Fishers in South Africa include fishers from commercial sectors as well as the recreational sector and small-scale. This fishing sector has largely similarly categorized relationships with the other sectors as the offshore fishing sector. The relationships with the small-scale fishers, oil and gas processing, port services and undersea cables are however considered to be different. In South Africa inshore fishers in the commercial line fish and rock lobster sectors overlap with small-scale fishers in the species they target. Thus, their relationship will be a competitive one. The oil and gas processing operations will compete for inshore or coastal space with the inshore fishing sector. Inshore fishing sectors will generally have to give-way and make space for port functions. This will exclude inshore areas in and around ports from ocean space available for inshore fishing. The interaction is defined as amensalism, as port services, especially if established, are unaffected by the inshore fishing sector. Undersea cables are regarded as beneficial to inshore line fishers, as this infrastructure excludes other forms of ocean floor usage and therefore may provide uninterrupted sea space for the inshore fishing above the cables, as these fisheries do not generally target the ocean floor with potentially damaging materials such as bottom trawls. As the cables are unaffected by this fishery the relationship is categorized as commensalism.

6.5.3. Small-scale Fishery activities, while having some similar interactions to offshore and inshore commercial fisheries with non-fishing sectors, does have more distinct interactions with some of the other coastal sectors. Small-scale fishing is negatively impacted by the offshore fishery when targeting the same species such as line fish. This species overlap is possible on the Western and Southern Planning Areas, where small-scale fishers target a range of line fish from boats. On the west coast there is also a traditional beach net fishery, which is regarded as inshore commercial rather than small-scale in South Africa. The offshore fishery, due to its volume and target species is relatively unaffected by small-scale fishers, hence making this relationship one of amensalism. Amensalism also describes the relationship small-scale fishers have with oil and gas mining, shipping, port services, water effluent pipelines and undersea cables. While these sectors are generally unaffected by small-scale fishing, they do impact negatively on this sector, either in terms of limiting access to potential fishing space in the inshore area such as exit points of undersea cables and boat or ship traffic routes and entrances adjacent to ports. Small-scale fishing is also negatively impacted by the perception of potential pollutant impacts on fish such as from oil and gas mining operations or effluent pipelines. Wind farms, if in the coastal zone, could be beneficial to small-scale fishers foraging on the coasts. Wind farms allow limited access to the general public, but could be managed in a way to allow for small-scale fishers to safely access these areas. Road infrastructure built to provide maintenance routes to wind farms can also be used to extend coastal space accessible to small-scale fishers. Small-scale fishing has a commensal relationship with boat based whale watching and shark cage diving, as these sectors can bring more tourists to the region, expanding the market and increasing the trade in small-scale fish products. Small harbours are often associated with boat based whale watching and shark cage diving, creating opportunities for small-scale fishing operating from these harbours to benefit from the visitors to the area. These offshore tourist sectors are generally unaffected by the small-scale fishing activity. Public protest action by small-scale fishers does however have the possibility to hamper the travel of tourists to small harbours supporting boat base whale watching and shark cage diving.

6.5.4. Aquaculture and the fishing sectors have a mutualistic relationship with each other as they co-build the brand of the region as a fish producing area. These sectors also benefit from requiring and sharing various support industries such as harbours and port facilities, cold storage and shipping. Aquaculture may benefit from the oil and gas industry in terms of accessing ocean and coastal space for aquaculture farms in proximity of oil, gas and mineral mining and processing operations. Mining installations are generally secured from other activities, providing for uncontested space. Coastal mining installations also have operational infrastructure such as electricity, water supply and security. Interviewees associated with this sector emphasised that once operational, and meeting international best practice guidelines, oil and gas mining operations, have focused, limited and predictable impacts on the immediate environment. With this interpretation the interaction between aquaculture and the oil, gas and other mining sectors is defined as commensal, as the aquaculture sector does not have an impact on this mining sector, while potentially enjoying benefits from an association. A more traditional interpretation, would argue for a competitive relationship, due to perceived potential for polluting of aquaculture farmed produce from the mining sector. This relationship of amensalism is defined in the aquaculture interaction with the oil and gas processing sector, where the potential for pollution exists, but in addition there is the active competition for inshore and coastal space. The South African aquaculture industry is at present all coastal and inland based, with no offshore or sea cage operations. More coastal mining operations will also provide secure coastal habitat for ranching of marine species such as abalone, or inshore protected sea cage farming. Phosphate mining, where the process involves releasing post-mined sediment back into the water column, will negatively impact aquaculture. Specifically, aquaculture plants may take in water from the nearshore environment that is heavily loaded with sediment and this will be damaging to a range of farm efficiencies. Potential waste discharges from ships would also negatively impact aquaculture. Amensalism then describes the aquaculture relationship with shipping and phosphate mining, as these two sectors have a negative impact on aquaculture, without aquaculture impacting these sectors. Wind farms and aquaculture will have a commensal relationship as wind farms provide potential coastal sites that can accommodate aquaculture farms. Wind farms generally take up coastal land space that cannot be shared with other coastal industries or urbanisation. However, wind farms could co-exist with aquaculture farms. Wind farms do not produce polluting waste or effluent streams, and like the coastal mining installations will be serviced with security services, electricity and road infrastructure. Aquaculture and coastal tourism are regarded as mutualistic as aquaculture farm visits, including purchasing and consuming of farmed products can be integrated into coastal tourism experiences. Boat based whale watching and shark cage diving enhance the attractiveness for coastal tourism and experiences. Aquaculture will benefit from these, both in terms of actual visits of tourists to farms but also benefit from marketing of the region as one being associated with quality, eco-friendly ocean experiences. Marine protected areas are regarded as being competitive with aquaculture, as generally these two sectors compete for exclusive use of an ocean or coastal area. Marine protected areas that are zoned exclusively for 0% impact will exclude aquaculture farms, due to the extraction of sea water, and release of waste water from the farms into the protected area. If a site is declared a protected area for purposes other than biodiversity or ecosystem protection, such as for heritage purposes, this may allow for some aquaculture activity if it is non-intrusive into the heritage aspects. This may then even add to the tourist appeal of the area by offering tourists the additional activity of visiting the aquaculture farms.

6.5.5. Summary of Ocean Sector Interactions

All categories of interactions identified by Klinger and colleagues are present in the interactions across the South African ocean sectors (Klinger et al., 2018). Generally, ocean sectors that compete for the same natural ocean resource or input are competitive and cannot co-exist. Sectors that use resources in a non-consumptive process can co-exist, if they are not in the same physical space. Sectors have a mutualistic relationship if all co-existing sectors contribute to and benefit from healthy and well-functioning natural environments.

Competition does not only apply to living marine resources but in reality is most evident when the physical ocean space is required by two or more sectors at the same time. This is evident for example in offshore fishing, sea bottom mining and undersea cables. All three of these activities require the ocean floor, and could not co-exist if they are to be operational at the same site at the same time.

Fewer relationships were evaluated to be in those intermediate categories of Antagonism, Amensalism, Commensalism that occur between the Competition and Mutualism extremes. These intermediate categories are related to the scale of activities, more instances of these relationships may be observed within specific areas of sector interaction. Marine protected areas offer clear uncluttered ocean spaces for shipping, offering support for innocent passage through an ocean area. This offers a benefit to shipping, and generally such passage is regarded as not being harmful to the MPA. In a focused interpretation, shipping will be assessed to have a negative impact on the MPA through physical disturbance, air pollution and noise impacts. Noise has been an under-estimated source of pollution but in recent years is receiving more attention (Weilgart, 2018). Similarly, offshore oil drilling and demersal fishing may be seen as competitive for the same ocean space, however once drilling is set up and operating smoothly, the mining operation provides 24 hour surveillance of a the adjacent fishing zone – benefiting the fishery.

In categorizing relationships across the sectors resolution becomes important. At the very fine scale, relationships considered to be generally mutual, may become competitive, such as shark cage diving and boat based whale watching cannot occur at the identical location, but generally non-consumptive tourist activities benefit each other by promoting complementary marketing and environmental functioning and quality. Similarly, within the tourism sector, beach activities such as swimming and surfing will be less attractive if this overlaps with or is in close proximity to an area of shark cage diving, where chum is used to attract sharks to the area.

The discussion thus far has centred on use of natural resources as inputs where interactions are often competitive There are however complementarities observed when infrastructure and labour resources as considered as inputs. All of the exploitative and non-exploitive industries benefit from Port and Harbour infrastructure, including waste water pipelines. A functional shipping industry is a critical area of support in importing supplies for, and exporting products of, the various ocean sectors. Labour, people willing to work at the coast or on the ocean, is a beneficial offering to the various marine sectors. This labour is required in both the primary and associated services, such a catering, security and maintenance of electrical and plumbing facilities on the various industry sector platforms and processing plants.

6.6. Decision Criteria And Considerations for Marine Spatial Planning

Criteria for decision making around prioritizing of ocean sectors in the marine spatial planning (MSP) process must include government priorities, as boundary conditions. Once these boundary conditions are created, the more technically orientated decisions can be made around which ocean sectors are compatible and can co-exist and which ocean sectors cannot co-exist as they compete for inputs. This was the overwhelming opinion of senior government officials interviewed, the need for framing conditions or strategic directions and objectives. This opinion incorporates the notion that MSP is not a technical exercise of rating compatibility of ocean sectors but there must be higher order, strategic, even nationalistic objectives.

The stated objectives of Operation Phakisa Ocean Economy Programme are the creation of jobs and increasing the GDP contribution from the ocean sectors. One interviewee noted that the Oceans Phakisa Programme is an economic development intervention, and therefore MSP decisions must be made to optimise economic outputs.

Chapter One describes that the Constitution is the highest authority in South African governance legislation, and contains the specific Section 24 which describes the objectives for environmental management and includes aspects of a safe non-harmful, environment; protection and conservation for intergenerational benefit; sustainable development and "promoting justifiable economic and social development" (South Africa, 1996, Section 24, p. 9). All of the environmental management legislation must follow these principles, and therefore these objectives form the outermost boundary conditions for MSP. Chapter Three outlines that in addition to the Constitution, South African has prioritised economic development through the Government's 9-Point Plan and the National Development Plan which covers 2010 to 2030. Both of these plans are very much focused on the growth of the South African economy, and the creation of jobs, as a means to address societal needs, and in particular alleviating poverty. The National Development Plan does have a focused chapter on Environmental Management, concluding that sustainability must be a consideration in economic development. The marine spatial planning objectives of the Green and White Paper on the National Environmental Management of the Ocean are carried forward into Objectives, Principles and Criteria in the Marine Spatial Planning Act (MSPA, 2019). These would form the inner boundary layers within which MSP takes place.

Figure 22 and Figure 23 illustrates proposed Decision Trees for marine spatial planning in South Africa. The first Decision Tree is focused on assessing whether or not an activity can be included as per the first requirement from the Constitution of not causing harm to people. The Tree proposes that as most ocean activities do cause harm directly or indirectly to people, some consideration must be given to the extent to which the harm can be negated. If the harmful impact can be negated upfront and before it can impact the environment or people, then the activity may continue. This may occur where effluent is fully treated by an industry before it is released into the environment. In reality there will be an acceptance that most sectors will have an impact on the environment and this impact will or potentially will have a negative impact on people. Internationally the accepted pollution levels are generally defined in terms of pollution limits such as upper limits for chemical waste and nutrients loading that maybe dispersed into the environment. South Africa does have existing water quality guidelines and in March 2019 published a revised set of guidelines for coastal marine waters, with the general principle being that the water quality of the receiving water must be maintained for the intended purpose of the water (DEA, 2019b). The NEMO White Paper in Section 6 containing the Priority Statements, offers a series of considerations for pollution that can be added into the Decision Trees. These could include marine geoengineering, ocean fertilization, carbon sequestration and storage, deep sea mining; sewage, noxious substances and alien invasive species. The White Paper also proposes that special recognition must be given to the rehabilitation of degraded habitats and that “Islands will receive prioritised conservation status.” (NEMO, 2014, Priority Statement 3.3.2, p. 16).

All of these considerations must filter into the MSP process and discussions where there will be formal and informal methods of ecosystem services trade-off analysis. A formal method of undertaking such analysis is described by Lester and colleagues who describe a trade-off approach that can be applied to MSP taking learnings from land applications (Lester et al., 2013). If the intervention is to negate the impact that is to occur during or after the activity, then there must be sufficient contingency planning and monetary reserve guarantees to cope with emergencies and undertake restoration. The Decision Tree proposes that if this condition is met then the activity may continue, noting that Phakisa Programme is intended to grow the ocean economy. If the impact cannot be negated, and is harmful to people, and permanently reduces the functioning of the ecosystem (and its intended designated use), then the White Paper suggests that the activity may not proceed. Intended designated use from the draft water quality guidelines include natural environment, recreational, industrial and aquaculture use. Using these categories from the draft water quality guidelines will provide some flexibility to designate areas of coast and ocean as impacted areas set aside for industrial use.

The second Decision Tree is focused on assessing whether or not an activity can be included with the same planning area as other activities. This is assessed through interrogating and categorizing the impact the activity will have with each of the other activities in the planning area. Synergistic activities may co-exist, however antagonist ones, must be separated in time and or space. If this is not possible and the impact is catastrophic on the prioritized sector, then the antagonistic sector cannot be included in the spatial planning area. This second Tree suggests that government will have to define a clear set of guiding priorities to select across ocean sectors and will require consistent application of these clear policy directives. These directives may be specific to each of the planning areas or be general principles governing all marine spatial planning decisions. A specific example of these could be that the Prince Edward Islands be prioritized for their science and education value. A more general priority could be that the no economic or industrial sector may replace an existing sector if that sector provides for less job opportunities, as encouraged by the Phakisa programme.

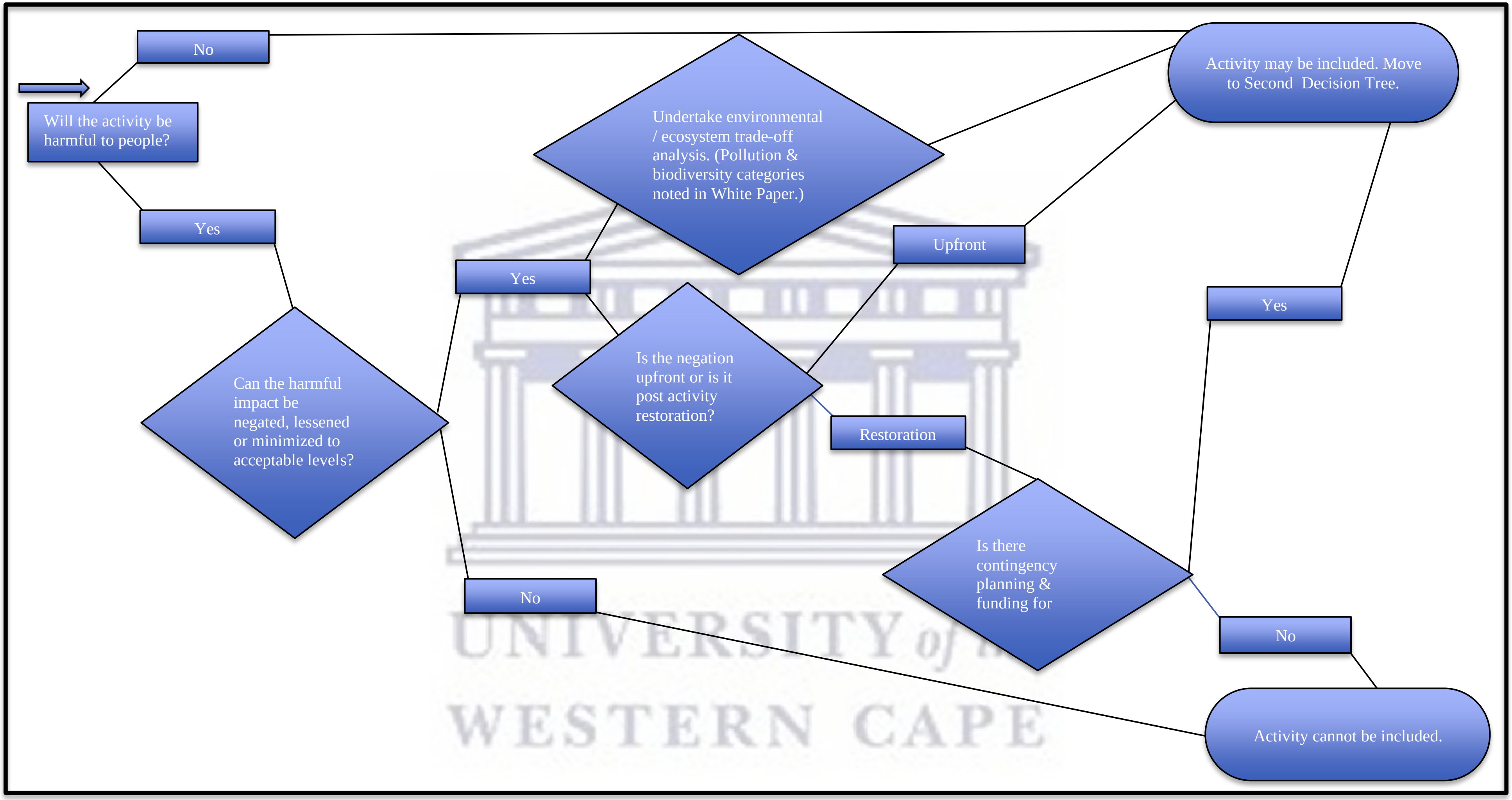

Figure 23. Decision Tree To Determine If An Activity Can Be Included In The Marine Spatial Planning. (Tree to be read in the direction of arrow.)

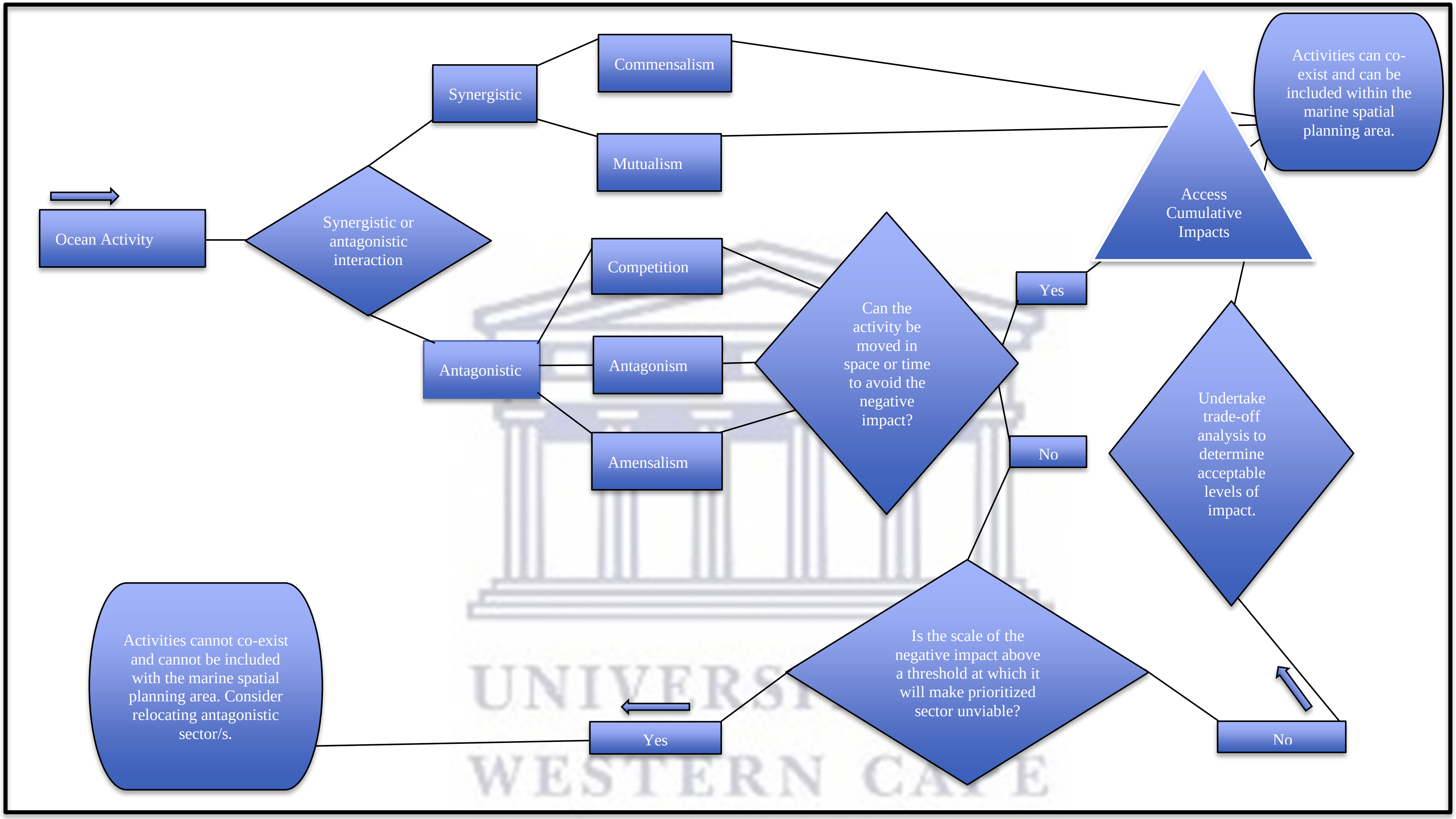

Figure 24. Decision Tree To Assess If An Activity Can Co-Exist With Another Activity In The Same Ocean Space And Time. (Tree to be read in direction of arrow.)

Selecting which sector to choose to exclude from a marine spatial planning area from a range of potentially antagonist ocean sectors will be difficult. This will require value-based judgements and will require decision makers to prioritise within various categories of returns or benefits. The decision-making process as outlined in the South African MSP Act are described in the section 6.5.3 below.

Returns and benefits have no inherit values, and their value is dependent on society being able to award or allocate value to a return. For instance, the benefit of conservation has a higher value when protection of biodiversity is valued, similarly, the value of the benefit of increased number of jobs created by ocean industrial sectors will also be highly valued where a country requires jobs to be created. Table 15 describes possible criteria that can be used to the value an ocean sector. The ocean sectors are drawn from section 6.3 above and include traditional and novel or emerging sectors. The benefits categories are derived from the Constitutional imperatives and from the government priorities discussed in Chapter Three.

Two additional benefit categories to those drawn from the Constitution and from established government priorities are included in Table 15: a) Impact on Coastal Access and Cultural Heritage and b) Transformation and Black Economic Empowerment. Coastal Access is an issue that is significant in South Africa as the pre-1994 government implemented a policy of apartheid, where only people regarded as being of the White race or of European decent where given prime land access rights including coastal land. The implementation of this policy included the forced removal and displacement of other races from their historically occupied and traditionally used land areas, including coastal land and beach access. Post-1994 the South African Government has implemented proactive policies to return and restore land access (ICMA, 2009; Snowman & Malan, 2018). The South African Supreme Court of Appeal not only recognised coastal access rights but also recognised the traditional rights of local small-scale subsistence fishers within a Marine Protected Area, and upheld their customary fishing rights in 2018. This occurred in the Dwesa-Cwebe Nature Reserve in the Eastern Cape Province (Yaw, 2018). Section 5 of the MSP Act stipulates as one of the Principles and Criteria for

MSP “the promotion of equity between and transformation of sectors” (MSPA, 2019).

The transformation of the South African Economy can be broadly described as developing a society and business sector where the wealth of South Africa is more evenly spread across the people, including across the race groups of South Africa. During Apartheid the white population group was allowed numerous unequal advantages to accumulate wealth. Redressing this is an important strategic objective of the present Government. This is evidenced in that the Office of the President heads a dedicated council on this matter: the Black Empowerment Advisory Council. Published Strategic Objectives of the Presidency include leading the Presidential Business Working Group and Labour Working Group to promote inclusive growth and job creation (The Presidency, 2015).

Table 15. Prioritizing Ocean Activities using Constitutional Objectives and Government Priorities. The Table includes examples of questions that could be posed during the MSP process.

Benefits: Constitutional Objectives & Government Priorities	Prevent Pollution & Ecological Degradation	Promote Conservation	Economic & Social Development		Priority Ocean Phakisa Sector	Impact on Coastal Access & Cultural Heritage	Transformation & Black Economic Empowerment
Ocean Sector			GDP	Jobs			
Aquaculture				Will the aqucult-ure operation provide job opportunity in area that is job scarce at present?			
Oil & Gas			Will the GDP contrib-ution from the oil/gas mining install-ation be signific-ant?				
Transport & Manufacturing	Does the risk profile of the shipping fleet or cargo present direct,						

	catastrophic and likely risk to unique and or vulnerable marine habitat?						
Protection & Governance (Marine Protected Areas)						Will the implementat-ion of limited access to an MPA, restrict / remove traditionally and cultural access to a local community?	
Coastal & Marine Tourism							Does the planned Tourism business include local communities in the operation, benefit and profit sharing?
Small Harbours							
Fishing							
Under Sea Cables							
Carbon Storage							
Navy Weapons Testing							
Diamond Mining							
Phosphate Mining							
Desalination Plants							
Waste Water Pipelines							
Wind Energy							

There are no values in Table 15 as these values will be location based, and will also not be uniform across different categories of interest groups. Communities favouring coastal access and supporting cultural heritage, will have different rankings of values as those communities wanting to preserve nature at a pristine level. Government officials responding to the government priorities of increasing the tax base and job numbers will also have their own value determinations, as they balance this with environmental trade-off perceptions and analyses.

Government officials across all sectors interviewed did voice their perception that growing the economy and specifically the creation of jobs is an objective of marine spatially planning in South Africa. Sustainability considerations were also included in some of the government officials' objectives for marine spatial planning. However, the overriding sentiment is captured by one senior official who stated that: “South Africa has an unemployment rate close to or exceeding 30%. If Government Policies and implementation are not addressing the jobs situation, then they are irrelevant”. Industry representatives interviewed, while motivating for industry support and stability, did include sustainability as a consideration for marine spatial planning. The fishing industry representatives specifically noted the benefits of including sustainability considerations and supporting interventions such as marine protected areas. These allowed the sector to access markets like the European Union where sustainability considerations are valued in their market access provisions. As discussed in Chapter Five, South Africa’s deep sea hake sector is accredited through the Marine Stewardship Council, which allows this sector access to European markets. Similarly mining and shipping representatives interviewed noted that these sectors are generally owned and managed by large multi-national companies. As such these industries have internationally recognised codes of conduct, including best practice standards and actively seek to demonstrate their compliance with these. The respondents did include in their comments that national legislation should align with these industry best practice standards, which could also be used to direct compliance efforts.

The consideration that spanned all industry representatives interviewed was the need for early stakeholder engagement that continued throughout the MSP process. This aligns with the best practice and other country National Ocean Policies discussed in Chapter Three. Stakeholder inclusion was the central theme in industry representatives’ responses. One interviewee articulated this as “while stakeholder engagement is described in the gazetted MSP Framework and draft Bill, the mechanisms are not defined”. Further this respondent was convinced that industry must make their own arguments on the value of benefits from their sector rather than rely on an unaffected third party such as a government official who may be coordinating the MSP process. Two apparently opposing views from industry sector interviewees on jobs highlighted how value judgements may differ. New and emerging industries were seen to offer jobs to coastal people where no jobs existed or where numbers of jobs were declining. A fishing industry interviewee however argued “Why would MSP favour new and untested industries over the fishing sector which has a 100-year history of creating and maintaining jobs?" Another view from a novel industry supporter argued that "South Africa and southern Africa have huge amounts of ocean space, with many different ocean and geological conditions, the region must present itself as an area for testing and piloting new ocean and ocean floor technologies".

Table 15 presented here is not presented with values as these values will be sector driven, and even within sectors, may vary from place to place. Higher levels of environmental impact may be tolerated in some places over others. The need for ocean related jobs may be more critical in some localities than in other areas that may have multiple sources of job creation. Situations such as these may change value systems and rate job creation higher than full protection and conservation. Similarly, in order to address forced removals from coastal land during apartheid, access, including some user rights like traditional fishing may be granted in areas otherwise earmarked for no-take marine protected areas.

The valuing of benefits as proposed in Table 15 or any other benefits valuation will have to be completed by the various user and affected groups within each area identified to have a marine spatial plan. This value matrix will produce different results in different locations depending on how the stakeholders represent their sector and how their inputs have impacted the MSP process and influenced the decision-making authorities. Table 15 or adapted versions of it can also be used by decision makers to interrogate and make apparent their perceptions and prioritizations.

Marine spatial planning has occurred in several regions around the world, and there are various approaches on how to include value judgements. Often reducing conflict and maximising profitability is a key consideration for ocean sectors and MSP processes. White and team demonstrated how using MSP can improve financial returns and reduce conflict between wind energy, commercial fishing and whale watching in Massachusetts in the USA (White et al., 2012). However, linked to how stakeholders perceive benefits, is how these benefits are shared between sectors or even among stakeholders. When there is a perception that benefits or costs are distributed unevenly then motivation to comply with Marine Spatial Planning rules can be impacted negatively. These issues were raised in MSP scenarios studies in the USA, Indonesia and South East Asia (Halpern et al., 2013).

The value of accessing and including social value judgements and aspirations in MSPs was illustrated in the marine renewable energy sector in Scotland (Kerr et al., 2014). This study concluded with a potential agenda for social studies research in this sector that can also be applied to other sectors and MSP in general. The social research issues ranged from how jobs and job prospects are impacted, including how the local existing communities and businesses can be upskilled to take advantage of the new sector and what government's role is in providing support to implementing the new sector in the region. In the South African context these can be applied to various initiatives in the Phakisa Ocean Economy projects ranging from aquaculture farms to ports and related activities such as ship servicing and building.

Including stakeholder aspirations and knowledge allowed for MSP to be incrementally improved in Tainan, Taiwan (Chang & Lin, 2016). This coastal area had the active sectors of oyster farming off rafts, trap fishers, cargo and other recreational boat traffic. Stakeholders aspirations and needs were gathered through workshops and questionnaires. Insights gathered through this process allowed for improvements in marine spatial planning through the separation of activities and also improved compliance.

Increasingly stakeholders are being included directly into the spatial planning aspects of MSP, through participatory mapping. In north-western Australia, an in depth interview process of 167 interviewees, which included mapping exercises, allowed for potential conflict areas to be mapped (Moore et al., 2017). Significant to the present discussion is that this study also allowed for value categories to be identified and defined across the sectors and communities interviewed. This demonstrated how value and quantities of value associated with ecosystem goods and services is not absolute or constant across groups of people.

The critical requirement of including stakeholders or a participatory approach in all aspects of marine management is argued for by Estévez and Gelcich, who systematically reviewed publications on multi-criteria decision analyses in marine management and conservation (Estévez & Gelcich, 2015). They concluded that while there is an improvement, indicating a willingness of governments to include stakeholders in multi-criteria decision analyses (MCDA) processes, this is still fragmented. The paper recommends that participation in the complete process of MDCA from clarifying problems through establishing objectives, determining alternatives, evaluating trade-offs and prioritizing alternatives, will improve the outcomes of the process. The extent and nodes of stakeholder participation in the development of marine spatial plans in the South African context is not defined by the Marine Spatially Planning Act (MSPA, 2019). This is an area of concern expressed by the stakeholders interviewed and will have to be clarified as the MSP process is implemented.

Marine spatial planning exercises must include a diverse set of value judgements. Value judgements have been formally included in some MSP exercises through the mathematical technique proposed by Saaty in 1980s and 1990s known as Analytic Hierarchy Process (Saaty, 1990). This technique has been used to determine optimal sites for particular ocean activities. Analytic Hierarchy Processes (AHP) allows for subjective considerations to be allocated a number value, which can then be used to transform various options into a rated set of options. The AHP approach was used together with Geographic Information Systems to identify optimal sites for cage aquaculture in Taiwan (Shih, 2017). This study looked at identifying optimal sites for cage fish farming of finfish, across family owned and cooperation owned farms. Considerations ranged from natural and climatic factors to water quality and socio-economic factors incorporating security and use conflicts. A similar approach using AHP was used to plan zoning in a multi-use protected area in the Sheik Seid Marine National Park in Eritrea. Stakeholders value judgements were incorporated into the process, and allowed for a participatory approach that is supportive of compliance with the marine plan developed (Habtemariam & Fang, 2016).

Thus far this discussion on decision criteria for MSP in South Africa has included technical assessment of inputs required by the various sectors to decision tree processes that are influenced by government priorities. This was followed by arguing that in addition to government priorities framing the boundaries of MSP, stakeholder considerations and value judgements must be taken in to account at the finer scales or during local implementation of MSP. This together with an equitable distribution of benefits and costs will provide motivations for all stakeholders to comply with the marine spatial plan that must be implemented. This gives the impression of a fairly open and transparent process where outcomes of the decision trees, and prioritization through a value allocation process by government and stakeholders will lead to the successful compilation and implementation of a marine spatial pan. Jones, Lieberknecht and Qiu conclude quite convincingly that this may not be the case (Jones et al., 2016). Their paper of the title "Marine Spatial Planning in Reality, introduction to case studies and discussion of findings" includes a study of 12 marine spatial planning case studies around Europe and concludes that MSP is often focused on achieving a particular advantage for a particular sector and is often related to one or more government priorities at the time.

The South African situation is that Government has made known its intention around an environment that is not harmful to people, conservation, economic growth, addressing access, black economic empowerment and inclusive growth. These high-level objectives should be apparent in the MSP process. The sector or sectors that can deliver the most optimal combination of these objectives should be prioritized for ocean resource inputs allocation and government investment. However, following the argument of Jones and co-authors (2016), the expectation is that those sectors identified by the Phakisa Ocean Economic Programme will receive higher valuing in the prioritization process, as these sectors align with the objectives of government of building these specified industries.

A further point of discussion, and one raised during the interviews with ocean industry sector representatives, is that the Department of Environmental Affairs processed a set of 20 Marine Protected Areas (MPAs) for a Cabinet decision in November 2018. One Industry representative noted that "Taking the MPAs to Cabinet was an unnecessary process, as in South Africa only the Minister of Environment can declare MPAs, so the reason for the Cabinet process is unclear".
The drafting of the marine area plans was to commence after the approval of the MSP Act. The advanced work on MPAs suggested to the industry sector representatives that MPAs were valued outside, differently and higher than the ocean industrial sectors. Importantly, the zonation of activities was not included in the Cabinet approval of MPAs. This will specify the activities and the extent to which industry can operate in the various MPAs. Interviewees representing industry sectors commented that it appeared that a marine spatial planning process around MPAs is occurring before and pre-empts the marine spatial planning process gazetted in the MSP framework, draft Bill and Act. The MPAs in South Africa are declared under the National Environmental Management Protected Areas Amendment Act of 2014 (NEMPAA Amendment Act, 2014), which was gazetted to allow for the original Protected Areas Act to be used to declare Marine Protected Areas (NEMPAA, 2004). Included in the Amendment Act are a set of restrictions that will exclude any commercial and industrial sector from a declared MPA unless the Minister of Environment zones the MPA for this activity. If the zoning process is inclusive in its approach, then this will in fact be an MSP process. However, this does in effect make the marine protection and governance objectives of the Department of Environmental Affairs the default position for MSP, and the other sectors then have to motivate away from this position. The development of the marine area plans as contemplated in the MSP Act, will have to merge with the ongoing implementation of the MPAs. The conservation imperative however does give action to the NEMO White Paper that prioritizes maintaining ocean ecosystem integrity in its Strategic Theme 3 and 4 (NEMO, 2014, pp. 14-18).

The effects of multi-dimensional accumulation and aggregation of impacts is an important additional consideration in MSP. The South African Green and White Paper noted that the addressing of accumulation and aggregation of impact over time and space is a key outcome of a policy framework for environmental governance (NEMO, 2012, 2014). Addressing the cross-sector impacts does support the positive aspect of building integration across government departments and supporting cooperative governance. This was demonstrated in Norway as it addressed managing and developing its offshore oil production (Olsen et al., 2016). Including the multi-dimensional aspect of cumulative impacts will allow for more informed decisions in MSP (Fernandes et al., 2017). This will mitigate against unintended consequences of managing impacts narrowly within sectors. This consideration will have to be formally included in the MSP process or else it may be lost across the sector debates for ocean space prioritisation. The South African MSP institutional arrangements described in the next section do appear to provide for such a platform for cumulative and cross sector planning.

6.7. Institutional Arrangements for Marine Spatial Planning

In 2018 the NEMO White Paper was converted into the draft Marine Spatial Planning Bill and submitted to the National Council of Provinces and the National Assembly of the South Africa Parliament for approval. Prior to the National Elections on the 8 of May 2019, the President of South Africa signed the Bill into the Marine Spatial Planning Act (MSPA, 2019). The Draft Bill which was first gazetted in 2017, and the Act that followed does not completely reflect the NEMO White Paper but rather is focused on the process of MSP in South Africa. Prior to the Bill a Framework for MSP was also published (Marine Spatial Planning Framework, 2017), which outlined the processes that would be contained in the Bill and the Act. This allowed stakeholders in the ocean sectors to comment on the planned MSP processes prior to the Bill being formulated.

The MSP Act sets up a hierarchy of committees ranging from the National Working Group, the Directors General Committee and the Ministerial Committee on Marine

Spatial Planning. The Department of Environmental Affairs is defined as the Chair and Convenor of these committees. With regards to the Directors General and the Ministerial Committees, the Department of Planning, Monitoring and Evaluation will act as Chair in the absence of the Department of Environmental Affairs. The Departments nominated to these Committees as permanent members are: Defence; Energy; Environmental Affairs; Fisheries; Mineral Resources; Planning, Monitoring and Evaluation; Public Enterprises; Science and Technology, Telecommunications; Tourism; Transport; and Rural Development and Land Affairs. Other Departments may be co-opted as required. It appears there is an attempt to include all sectoral departments that would be using the ocean space, surface, midwater, sea bottom and above-ocean air space in the case of public and security related aviation.

The National Working Group (NWG) functions to develop draft marine area plans based on existing and planned user profiles across the different sectors. These must be developed using the principles and criteria for marine spatial plans which are defined by the Act (Section 5) and discussed here in section 6.5.2. The NWG may appoint a panel of experts as required. These draft marine area plans are submitted to the Directors General Committee, which will make final recommendations to the Ministerial Committee, after they have considered overlaps and resolutions to potential conflicts. The Ministerial Committee will approve the plans, which will be reviewed every five years. All decisions are made through consensus, and the Act does not make allowance for dispute resolutions resulting from a situation where Ministers cannot reach consensus. When the Committee below the Ministerial Committee cannot reach consensus, all options must be presented to the Ministerial Committee, who presumably will make a decision.

Section 8 of the MSP Act requires that the NWG consult a range of stakeholders on draft marine area plans, including sector departments and affected organs of state, institutional coastal planning bodies; industrial representative bodies, representative organisations of affected institutions and persons and the general public. While labour representatives are specifically not noted in this list, one can assume that the broad definition of the categories in the list will apply to labour organisations. In addition to the NWG undertaking consultations, Section 8 requests that each Sector Department must also engage their sector on the plan, and the outcomes of this consultation must be available to the MSP processes. The implementation of Section 8, will address the many industry sector interviewee responses, where more engagement in the marine spatial plans was requested. Some interviewees called for the ocean sector engagements to be made at all levels of the MSP process, the Act however only makes provision for consultation at the NWG level and not directly at the Directors General or Ministerial Committee. This may not be sufficient for the ocean industry sectors.

The Marine Spatial Planning Act and the institutional hierarchical arrangements it proposes is a significant build on the proposal of the 2014 White Paper on National Environmental Management of the Ocean. The White Paper suggested the use of the existing Cabinet Committees, in particular the Economics Cluster of Departments and Ministers. The Directors General and Ministerial Committees will raise the profile of ocean governance and building of the ocean economy. Considerations for these defined institutional arrangements must include their resourcing and relationship with participating Departments.

6.8. Marine Spatial Planning and the Ecosystem-Based Approach to Marine Environmental Management

The South African Marine Spatial Planning Act follows the strategy of the Green and White Papers on Ocean Governance and includes the Ecosystem-Based Approach (EBM). The MSP Act states specifically in the Principles and Criteria For Marine Spatial Planning “the advancement of an ecosystem and earth system approach to ocean management which focuses on maintaining ecosystem structure and function within a marine area” (MSPA, 2019, Section 5).

Chapter Five concludes that ecosystem based marine management (EBM), together with a boarder earth system-based marine management is a recurrent theme in the South African Green and White Ocean Policy Papers.

Chapter Five also concludes that in order for South Africa to better implement EBM, is must engage in cross border ocean governance agreements. South Africa is physically associated with the Atlantic and Indian Ocean. It is also, albeit through larger distances, connected to the Southern Ocean, defined as the ocean area between Antarctica and the 60^0 south latitude. South Africa will then need to have functional bi- and multi-national arrangements with South Atlantic, South Indian and Southern Ocean to implement EBM in ocean governance. Further discussion of earth system considerations is included in Chapter Seven.

6.9. Critical Support Infrastructure for Implementing Marine Spatial Planning in South Africa

The Marine Spatial Planning Act (Section 7) requests that the Minister of Environmental Affairs create a Knowledge and Information System . The System must store information that will support the development of marine area plans and must include ecological, social and economic information; existing and future uses from the various ocean sectors, outcomes of consultations and information on approved marine area plans including amendments and reviews. This is noteworthy, as a shared knowledge and information platform was identified in Chapter Three as a critical aspect of facilitating marine spatial plans. Some type of electronic knowledge platform was evident in most of the other country Ocean Governance Polices reviewed. This concept is also covered in the South African Green and White Papers on the National Environmental Management of the Ocean but lacked the detailed description included in the MSP Act. South Africa has through the Marine Protection and Governance projects within the Phakisa Oceans Economy Programme developed the National Oceans and Coasts Information System (https://www.ocims.gov.za/). This has been a joint partnership project between the DEA and the Council for Scientific and Industrial Research (CSIR), which is a research council of the Department of Science and Technology. This system incorporates various data sets and has produced operational knowledge-based tools that are available freely to the different sectors and the public. This system is described in Chapter Four. The System does have marine spatial planning application or tool which at present is not fully available to the general public. This

National Oceans and Coasts Information System (OCIMS) is a possible candidate for the Knowledge and Information System described in the MSP Act.

Chapter Three also concludes that for marine spatial planning to be successfully implemented "mandate, authorities and resources for MSP must be clearly defined". The MSP Act does clarify roles and responsibilities and squarely sets the Minister and Department of Environmental Affairs as the coordinator of the MSP process and institutions. The Minister of Environmental Affairs is expected to work on a collegial basis with Ministers of the other Sector Departments, and all decisions must be made on consensus. The MSP Act states that all sector departments must submit information upon request to the Minister of Environment. There are no consequences for non-compliance with requests, nor recourse outlined if departments do not engage with the MSP process, or chose not to implement the marine area plans. Recourse or consequences are possibly not included, as this being an Act of Government, required compliance is assumed. Section 3 of the MSP Act binds all organs of state into the MSP process, and further notes that all other rights, permits and authorizations issued under any other law must be consistent with the approved marine area plan. Section 4 of the Act stipulates that if conflict relating to MSP arises between this Act and any other Act, the MSP Act prevails. The MSP Act therefore does define processes, institutions, mandates and authority.

Government Officials interviewed from ocean sector departments outside the Department of Environmental Affairs (DEA), noted that there will be a need for training in marine spatial planning in other departments. The DEA has over 2015 to 2019 established a National Working Group with Director General-nominated officials from each of the sector departments. Interviews with the coordinating officials for this Committee suggests that the group did meet monthly initially and thereafter meetings where held as required to take MSP process forward to a point in early 2020 where the Working Group is now drafting the first marine area plan. Interviewed officials did acknowledge that the Working Group was a solid beginning of building capacity in each of the sector departments, however sector departments would need to more fully acknowledge MSP as a business output and formally incorporate this into their internal annual work plans. Officials from outside the DEA noted that MSP was generally added to existing work loads of officials. The resourcing of the MSP function will require investment both within DEA and stakeholder departments.

6.10 Discussion: Implementing Marine Spatial Planning in South Africa

For South Africa to implement marine spatial planning there must be an appropriate authority to champion marine spatial planning and ideally MSP processes must be outlined in an Act that clarifies roles and responsibilities – this has been largely achieved with the MSP Act. There is some essential critical institutional and infrastructure support required that will increase the probability of success in implementation.

Marine spatial planning is an exercise in cooperative governance. Sector departments therefore need a platform to share information on their sector ocean use requirements, so that planning across sectors can take place. Computing and mapping tools currently available allow for these uses to be mapped and can demonstrate overlaps graphically. Such representations will also allow for representations of accumulated and aggregated impacts, so that these can be management collectively. There is also a range of MSP decision support software tools that is available, and that can be used in the MSP process at the local and regional scales. There is concern with these decision support tools though. At present they are largely used in academic studies, possibly because they are difficult to use and therefore not used in real world Government-led MSP exercises (Janßen et al, 2019). The complexity of one such MSP tool, MARXAN, is demonstrated in a study in South Africa focusing on a multi-scale multi-level spatial planning methodology for application in recommendations on marine protected areas. The authors of this study however suggest that the use of the overall approach is relatively simple and replicable (Lagabrielle et al., 2018).

Computing tools and visualizations must be selected appropriately to be functional and value adding at the detailed and local to national and regional scales. South Africa’s National Ocean and Coastal Information System is at present capable of describing ocean sectors and their use from municipal to national scales. This current system is probably sufficiently functional at this stage to demonstrate overlaps and categorize interactions across sectors.

Stakeholder engagement is identified in MSP best practice guidelines, and is the most recurrent theme in interviewing ocean sector representatives. Providing sufficient access to and communication on the development of marine area plans is a critical success factor in the South African context. The South African MSP Act does instruct that stakeholder engagement must occur in the early drafting of marine area plans, but is not definitive on engagement as the plans go through the levels of the Directors General and the Ministers for approval. It remains to be tested if this will be viewed as sufficient access to the process.

Providing clear mandates and coordinating roles is essential for MSP. The MSP Act is among several South African Acts that require cooperative governance. The National Environmental Act requires institutionalized cooperative government arrangements as well. There is debate as to whether these cooperative governance arrangements have worked in the environmental sector in South Africa (Bosman et al., 2004; Truter, 2014).The shared roles between the Minister of Environment and the Minister responsible for Planning, Monitoring and Evaluation will raise the profile of the MSP related institutional arrangements and this association with the Presidency may add support for its successful implementation. The Phakisa Ocean Economy Programme will also build the profile of the MSP related work. The MSP Act clearly allows for the Minister of Environment to request detailed information on ocean sector use from the sector departments as contributions to the MSP process. The successful use of this mandate will be essential for the development of relevant and compete marine area plans.

The MSP Act does require consideration of the ecosystem and earth system approaches in its implementation. South Africa is relatively isolated in the geographic position on one end of the African continent. This provides South Africa with a range of challenges and opportunities in implementing these approaches. South Africa must collaborate with countries sharing large marine ecosystems on the west coast and east coast of South Africa and the Southern Ocean. While the active participation in three large marine ecosystem programmes will require significant investment of officials' time and resources, this does provide South Africa with a means of setting common, regionally cohesive and nationally beneficial agendas on a large percentage of the planet's ocean spaces.

Finally, while much emphasis in MSP is focused on separating sectors that compete for infrastructure and ocean space inputs, there is a growing perspective that MSP must also be used to place complementary sectors together. The benefits of actively coordinating complementarity across sectors in minimizing negative impacts and maximising the common infrastructure and social inputs and outputs are undervalued in MSP (Klinger et al., 2018). With South Africa aiming to develop its ocean economy from a relatively low base, marine spatial planning could be used to create and promote hubs of synergistic ocean sectors.

The South African ocean space, while not being as heavily active with maritime industries as other parts of the world, does have large sections of its Exclusive Economic Zone, allocated to existing uses, such as shipping tracks, fishing areas, and mining options, albeit not active exploitation. The MSP Act is silent on how these existing rights will be integrated into newly created marine area plans. How the Department of Environmental Affairs deals with this in its implementation of the MSP Act remains to be seen.

Implementation of the marine spatial planning act will require a transparent process, with functions of roleplaying departments defined, and a clear set of consistently applied criteria for decision-making.

7. Considerations for Implementing the South African White Paper on National Environmental Management of the Ocean – NEMO

7.1. The NEMO Policy Proposition

The South African White Paper on the National Environmental Management of the Ocean (NEMO, 2014) introduced marine spatial planning as the primary mechanism for governance of South Africa's ocean space. Marine spatial planning (MSP) is presented in this study as the additional policy value proposition of the NEMO White Paper. The marine spatial planning proposal of the White Paper was separated from the rest of policy direction and developed as a Bill which was promulgated as the South African Marine Spatial Planning Act in 2019 (MSPA, 2019).

This Chapter will develop and describe in greater detail the South African ocean governance context in which marine spatial planning will occur. Ideas and concepts on the ocean governance context were defined through a series of interviews with key informants and in particular with government officials charged with implementing the Marine Spatial Planning Act. Their views together with the discussions from previous Chapters, are now amalgamated in this Chapter to describe the ocean governance context in South Africa. The analyses of these interviews, together with the insights from literature reviewed and discussions in previous Chapters is mapped into a concept map of ocean governance. This mapping of the context of ocean governance in South Africa provides the operational, social and political realities in which marine spatial planning will be implemented. This study is primarily focused on the implementation of ocean governance in South Africa, hence a description and understanding of the local context in which governance, including marine spatial planning, will be implemented is necessary. This will improve the probability of successful implementation through allowing for implementation planning to consider peculiarities of the South African context.

Governance, in its modern definition, incorporates and requires high levels of citizen consultation and even participation in the development of governance frameworks. This is true and evidenced in ocean spatial planning frameworks across the world from Scotland (Smith, 2018) to East Asia (Gonzales et al., 2019) and the Pacific Ocean (Keen et al., 2018). Governance in the 21st century democracies has seen a transition, from a ruling elite crafting and implementing an administration framework over the largely disempowered masses to increasing demands from citizens for participation and partnership in developing and implementing governance frameworks and policy (Runya et al., 2015). Smith describes this process as it relates to ocean governance in the Scottish context, and refers to the ladder of stakeholder engagement proposed by Arnstein (Smith, 2018). Arnstein proposed levels of stakeholder engagement that progressed from non-participation or superficial engagement involving just information sharing, through consultation which was described as taking place in degrees of tokenism, to eventually degrees of citizen power which involved partnership, delegated power and even citizen control (Arnstein, 1969). Marine spatial planning (MSP) has been described as a participatory political process to spatially plan the use of the national ocean spaces (Ehler & Douvre, 2009), and is often proposed as being democratic and inclusive in its approach.

This concept has however received some criticism, including that levels of inclusivity in stakeholder engagement are inadequate and that decisions during marine spatial planning are based on “best available knowledge”. Best available knowledge however can be narrow in its definition, often aligning to formal academic knowledge, particularly in the natural sciences. This interpretation is exclusionary to traditional and cultural knowledge sets and values. Moreover some values associated with ecosystem benefits and services cannot be spatially defined and managed, such as aesthetic or religious and cultural beliefs (Tafon, 2018; Flannery et al., 2019). These are concepts that must be considered in the particular local contexts where MSP is to be implemented. Traditional knowledge contributions to environmental management are recognised in several of the global forums such as the CBD (Tengö et al., 2017) and the United Nations Food and Agricultural Organisation’s Code of conduct for Responsible Fisheries, specifically paragraph 6.4. of the General Principles Chapter (http://www.fao.org/3/v9878e/v9878e00.htm#6).

The international ocean governance agenda introduced in Chapter Three is also discussed here as necessary considerations or drivers of the South African ocean governance context. These include a range of the international and regional agreements that South Africa is party to such as the UN CBD, including its science platform the IPBES, UNFCCC and the regional Indian Ocean Rim Association (IORA). The UNFCCC statements on the climate change – ocean linkages and agenda illustrates this steadily advancing ocean governance driver.

This Chapter also includes a comprehensive discussion of the concept of ocean ecosystem services and benefits. This discussion is necessarily associated with the context of Ocean Governance for two reasons.

Firstly, an objective of Ocean Governance across all countries, including South Africa, is that conservation of the ocean must be for the benefit of present and future generations. The notion of intergenerational conservation of ecosystems must be centred around maintaining the integrity of the ocean ecosystems so that they continue to play their role in the Earth System and that there is no net loss in the ecosystem services and benefits they offer future generations. Although this objective of sustainability, and no net loss of benefits and opportunity from natural systems may be unrealistic in many contexts, it remains generally the vision of environmental management as evidenced by the discussion in Chapter Three. The concept of ocean integrity is articulated in the South African Green and White Papers on Ocean Governance in South Africa as a Strategic Objective. The Marine Spatially Planning Act of South Africa has as one of its six Objectives “Conserve the ocean for present and future generations” (MSPA, 2019, Section 2).

Secondly, implicit in the development and approval of marine spatial plans will be the prioritization of activities in the ocean. This was the primary focus of the preceding Chapter. Chapter Six also provided Decision Tree options and criteria that can be used to make choices in constructing and approving marine spatial plans in the South African context. In the prioritization processes in marine spatial planning, trade-offs will have to be made. During trade-offs, valuations are made consciously or unconsciously on what management option or ocean activity will derive the most return of benefits to society. Included in these valuations will be an assessment of what activities will cause the most harm or negative impacts to society or ocean ecosystems, and their inherent processes. These negative impacts on ecosystem functioning are perceived as limiting the human beneficial services that ecosystems provide (Guerry et al., 2012; Böhnke-Henrichs et al., 2013; Costanza et al., 2014; Arkema et al., 2015). Time periods for return of benefits to society may be considered within or across generations.

A common thread of historic and current frameworks of ecosystem services is that ecosystem processes provide natural services that produce benefits and goods that are of value to humans (Costanza et al., 2017; Mehvar et al., 2018; Martino et al., 2019). The Millennium Assessment of Ecosystems that was undertaken almost a decade and half ago categorized ecosystem benefits into four broad and related categories of Supporting; Provisioning; Regulating and Cultural (MEA, 2005). There have been several discussions of improving these categorizations of ecosystem benefits and services, including frameworks for understanding value associated with ecosystems (La Notte et al., 2017). The notion of ecosystem services and benefits is explored in two versions of monetary valuation in this Chapter. Valuation is explored in terms of a contribution to Gross Domestic Product approach (Hosking et al., 2014) and through a gross calculation of the value of South African ocean ecosystems using previously assessed values of ecosystem types (Costanza et al., 2014). Frameworks and conceptualizations of ecosystem services and benefits have received much attention in studies over the last 20 years because these must be the articulated outcome of ecosystem-based management. Standardization of the meaning of ecosystem services and benefits will allow for the assessment and comparison of ecosystem based management interventions (La Notte et al., 2017).

Clarifying the usefulness of the marine ecosystem valuations; defining ecosystem services and benefits and mapping the broad range of issues within the ocean governance context in South Africa are all necessary foundational steps to implementing policies and tools for ocean governance.

7.2. Research Methods

The key informant evidence gathering exercise was primarily targeted at senior government officials that had responsibility of implementing marine spatial planning either within the Department of Environmental Affairs or in related ocean sector Departments. In addition, role players from ocean industry sectors were interviewed as well as senior office holders of the Benguela Current Commission. Academics and policy advisors constituted the smallest number of interviewees. A total of 21 key informants were interviewed. A categorized list of the key informants is annexed as Appendix 4. The University of the Western Cape's interview protocols were followed, including the completion of the consent form by each interviewee. The template of the consent form and the interview questions are attached as Appendix 5 and 6. Among the interviewees there were five females, and in terms of race, the majority were Black African Persons, with two White Persons, five Coloured Persons and one of Indian decent (race classification as per the South African Department of Home Affairs for demographic counts). All persons interviewed were between the ages of 40 and 65 except for one, who was younger. The majority of interviewees were government officials with seven being employed outside government.

The interviews were semi structured and allowed for interviewees to express issues and concepts within ocean governance from their perspective (Yin, 2009; Smith, 2018). Additional description of the interview approach was included in Chapter Two. The concept map developed in this Chapter features recurring issues raised in interviews. The relationships, groupings and linkages described in the concept map are constructed by the researcher/student based on conclusions from preceding

Chapters and discussions during interviewees. The Grounded Theory approaches of coding phases was applied to the various levels of the concept map starting from defining the pillars or columns to the concepts within each pillar and then the relationships across pillars.

Two methods of economic valuation of ocean and coastal ecosystems were contrasted. This study calculated the total value of South Africa's ocean and coastal ecosystems by using 2011 values proposed by Costanza and team for different ecosystem types (Costanza et al., 2014). The country area per marine ecosystem type was calculated from a categorization of habitat types from the South African National Biodiversity Institute (SANBI, 2018). This valuation was then contrasted to an existing calculation of the ocean contribution to the national Gross Domestic Product for 2010 (Hosking et al., 2014). The functionality of both methodologies is discussed, as well as the use of a monetary valuation for ecosystem services in the broader framework for understanding environmental goods and services.

7.3. Valuation of South African Marine Ecosystems

Robert Costanza, Rudolf de Groot and co-workers established a methodology for assessing the monetary value of natural ecosystems. This was over a series of publications since the late 1990s. In 1997 Costanza et al., calculated the global value of ecosystem services by estimating the benefit value of 17 ecosystems across 16 biomes (Costanza et al., 1997). In 2014 this was revisited and value estimates of ecosystem services were revised, largely using calculations from a 2012 estimation of the monetary value of ecosystem services (Costanza et al., 2014a). The 2012 valuation of ecosystems sought to revise the 1997 estimations and included several more case studies that were completed since the 1997 study (de Groot et al., 2012). During the first decade of the 21st century the United Nations Environment Programme implemented The Economics of Ecosystems and Biodiversity study (TEEB) which outlined the biome classification and methodology used in these economic valuations of ecosystems (Van der Ploeg., 2010; Kumar et al., 2013).

Table 16 illustrates the total value of the ocean and coast ecosystems of South Africa. The Table describes the area in hectares per biome for the South African Exclusive Economic Zone in terms of estuaries, coasts and open ocean. The area per biome is calculated as reflected in the most recent South African National Biodiversity Assessment (Harris et al., 2019). The Shelf area is calculated by subtracting the coastal area from the total marine area. Estuarine area valuation is represented independently from Coastal and Shelf areas as the area of Estuaries was estimated separately in the National Biodiversity Assessment. The ecosystem values associated with each of these ecosystem or biome types are obtained from the ecosystem service values estimated in the Constanza et al., (2014) study. (Note: The Costanza et al 2014 study used the 2007 US$ currency unit.) The value of the ocean and coastal ecosystems off mainland South Africa is assessed by multiplying the area per biome by the value estimated in the 2014 study and summing these values for the Estuaries, Coasts and Shelf. The value of ocean and coastal ecosystems around South Africa's Prince Edward Islands is here allocated the Open Ocean value. Marine as a broader biome category, comprising coasts and shelf systems, was also be calculated separately, as the Constanza study provided a valuation estimate for a Marine category as well. The total valuation of the ocean and coasts ecosystems within South Africa's mainland EEZ in 2019 South African Rand equivalents, as calculated using the 2011 ecosystem valuation estimates of Constanza et al (2014)[7] is approximately R3.6 trillion. The valuation of the South Africa ocean off Prince Edward and Marion Island is about R450 billion. The combined total of these is approximately R4.1 trillion. Using the collective marine biome which includes all the coastal and shelf areas, the estimates valuation of ocean in South Africa mainland EEZ is R2.1 trillion. Table 16 shows valuation estimates in 2007 US$ values and which are also converted to 2007, 2010, 2011 and 2019 South African Rand values (ZAR). The authors of ecosystem valuation studies noted above provides in their introduction cautions on the appropriate use of such valuations. These are not intended to be market or trade-able estimates. These cautions are discussed below Table 16.

[7] Note that while the Constanza study finding was published in 2014 estimates used were designated in the publication as 2011 estimates.

Table 16. Valuation of Ecosystem Services using the biomes area estimates from the National Biodiversity Plan Estimates and the Ecosystem Valuations from Constanza et al., 2014.

Marine Biomes as described in Costanza (et al., 2014)	National Biome Area (square kilometre) from SA National Biodiversity Assessment 2019	National Biome Area (hectare)	2011 Ecosystem Service Valuation Estimate (2007$/ha/yr) as per Costanza et al., (2014)	Value of Biome	Value of Biome in Millions
Marine	1072211	107221100	1368	1,467E+11	146678,465
*Open Ocean	475238	47523800	660	3,137E+10	31365,708
Coastal	94076	3407600	8944	3,048E+10	30477,5744
Estuaries	2006	200600	28916	5,801E+09	5800,5496
**Seagrass/Algae Beds			28916		0
Coral Reefs**			352,249		0
***Shelf	978135	97813500	2222	2,173E+11	217341,597
Total Marine Ecosystem Valuation in Millions					
Total Ecosystem Evaluation	Sum of Coastal, Estuaries & Shelf	Open Ocean	Marine	Sum of Coastal, Estuaries & Shelf + Open Ocean	Marine + Open Ocean
2007US$	253619,721	31365,708	146678,465	284985,43	178044,173
2007 ZAR****	1788019,03	221128,241	1034083,18	2009147,3	1255211,42
2010 ZAR****	1856496,36	229596,983	1073686,36	2086093,3	1303283,34
2011 ZAR****	1838742,98	227401,383	1063418,87	2066144,4	1290820,25
2019 ZAR****	3634370,6	449470,596	2101902,4	4083841,2	2551373

*Open Ocean area in this study is allocated to the area that was assigned to the sub-Antarctic marine ecosystems in the National Biodiversity Assessment of 2019
** Biomes described with valuation estimates in the Constanza., et al., 2014 but not calculated in this study as separate from the coastal biome
***Shelf area was calculated from subtracting the area allocated to the Coastal from the Marine area which represented the total area of oceans and coasts in the National Biodiversity Assessment of 2019.
****Rand Dollar exchange values used as from the South African Reserve Bank and can be located at (https://www.sars.gov.za/AllDocs/LegalDoclib/Rates/LAPD-Pub-AER-2012-02%20-%20Average%20Exchange%20Rates%20Table%20A.pdf)

The rand equivalent for 2010 is calculated so that this estimate can be compared with an valuation estimate made for the contribution of the ocean sectors to the South African GDP for 2010 (Hosking et al., 2014). The 2010 GDP contribution study estimated the value of the ocean sectors at R110 billion. This is an order of magnitude (billions compared to trillions) less than that of the ecosystem service valuation method used above. The contribution to GDP methodology is fundamentally different in that it does not attempt to value the ecosystem service, rather it attempts to calculate the contribution of the ocean to the GDP. The Hosking et al., (2010) study did this by apportioning a percentage value of the total value of an economic sector to the ocean. The percentage value allocated to the ocean was that portion that could be justified as being associated to the ocean either from the supply or demand side. The Costanza et al., (2014) and similar studies used a benefit transfer approach where several ecosystem services valuations and estimates were aggregated to produce an estimated value of ecosystem services per biome that can be used as a reference estimate. Ecosystem evaluations were based on associating monetary values for a range of services including provisioning; regulating, habitat, and cultural services. This approach is more fully described in the de Groot et al., (2012) study.

The Hosking et al., (2010) study and this study following the method of Constanza et al., (2014), used different approaches to develop ocean valuations in the billions and trillions respectively. The Costanza evaluation is understandably much higher as it attempts to account for common good services that are much broader than commodities. Valuation estimates are subjective and individuals or communities may value ecosystem services and benefits uniquely, resulting in different valuations for the same ecosystem (Jobstvogt et al., 2014; Saarikoski et al., 2016; Hynes et al., 2018).

Valuations of ecosystems services are important in that they provide a focus for environmental management debate and interventions. Costanza et al., (2014) cautions that although valuable and useful, ecosystem valuations can result in confusion when the valuation uses are not defined. There is particular potential for this to happen when such valuations and their uses are mismatched across various spatial scales and precision levels. Total values or macro-aggregates such as the one calculated above for South Africa are useful in raising awareness and interest. Low resolution and large value estimates are often used to encourage more precise high-resolution studies, as was pointed out in the Constanza and TEEB studies. Low-resolution estimates that are aggregated over the entire coastline and EEZ of South Africa will not be appropriate to compare management scenarios for a specific site along the coast. Such studies will require much higher resolution valuations as was used in the development of and selection of management scenarios in Belize and the European Union (Arkema et al., 2015; Jax et al., 2018).

Services valuations, services, processes, value benefits and goods are terminologies that have been used interchangeably and there have been recent attempts and calls to standardise approaches and definitions. Such standardised use will at least allow for comparison and interpretation between and among various site-specific studies (Mouchet et al., 2014; La Notte et al., 2017; Mehvar et al., 2018).

Generally across the environmental services debates, there is acceptance that natural systems like ocean and coastal ecosystems function through processes that produce goods and benefits that are advantageous to human beings in various ways. Goods may be defined as countable or measurable output such as tons of fish or oil whereas benefits will include processes that produce benefits to human beings such as cleaner air, rain, waste disposal, storm surge protection and habitat production to support coastal protection, fish stocks and biodiversity. There is a range of methods to create monetary valuations for these with common approaches being willingness to pay estimates or amenity value such as what will a property owner or municipality be willing to pay for storm protection, or how much are tourists willing to pay for a dive experience.

Estimating value for ecosystem services has an important function beyond being used to evaluate effectiveness of management interventions, or selecting among planning scenarios. Ecosystem valuation additionally and significantly makes apparent “hidden” benefits. These benefits, because they are provided free, tend to be undervalued or not valued. Such services may include sewage waste dispersal from coastal communities and cities, or provision of habitat for biodiversity support (Martino et al., 2019). Biodiversity support will also support maintaining of fish stocks and tourism attractiveness of coastal beaches and reefs. Through undertaking an inclusive process of providing a valuation of such services, their integrated roles in the more obvious benefits and goods can be illustrated to decision makers and user communities.

Constructing a monetary value for ecosystem services cannot be seen as establishing these as market or trade-able values but they must be used as reference points in the discussion of management and use options. Key contributors to studies of ecosystem services have maintained that the values must not be seen as values that can be used in privatizing, commodifying or trading of ecosystems (Costanza & Kubiszewski, 2012; Costanza et al., 1998b, 2014). They can however be used to motivate for citizens or companies to contribute through fees or user charges towards protection or conservation of natural systems, with the amounts paid not intended to meet or approximate the valuation estimate figures.

Ecosystem services valuation is required to raise the profile of these otherwise invisible common good services. This services often relate to the regulating services provided by natural systems. Ecosystem services are the conceptualization of how natural systems link to human/social systems and illustrate the delivery mechanisms through which these natural systems impact human well-being. Governance and political systems through defining how society engages with the environment defines areas of feedback and impact on ecosystems services (Costanza et al., 2014; Costanza & Liu, 2014; Costanza et al., 2017; Martino et al., 2019). These feedback influences can alter, enhance or negatively impact the availability of these ecosystem services.

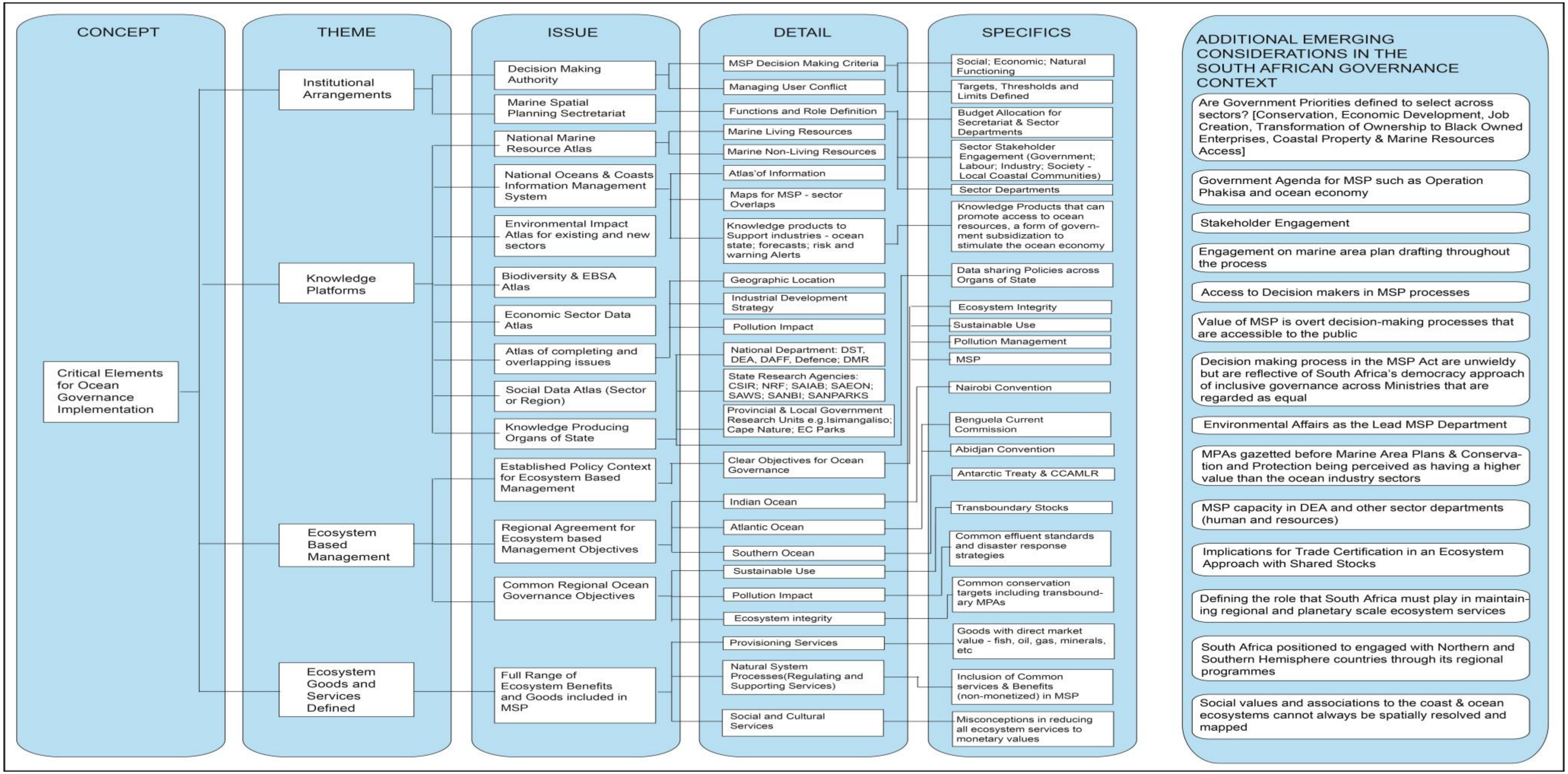

*Figure 25. Concept Map describing the Ocean Governance Context in South Africa. *Ecosystem Based Management (EBM), must be viewed as central to the Theme Pillar, with the three other areas within the pillar supporting this approach*

7.4. South African Ocean Governance Context

The Concept Map in Figure 25 describes the context in which ocean governance will be implemented in South Africa. The concept map is structured into six columns or pillars that group ideas into the Concept, Theme, Issue, Detail, Specifics and Emerging Considerations.

Central to the study is the Concept of what are the Critical Elements for Ocean Governance Implementation in South Africa, this primary concept and central research question is captured in the First Pillar. These Critical Elements are illustrated through a series of increasingly focused or narrowing lenses as the Concept Map progresses through the pillars. The units in each of the pillars represent sub-concepts that will have to be addressed in some form during the implementation of ocean governance in general and marine spatial planning in particular.

The Theme Pillar contains the four highest order critical elements that must be considered for Ocean Governance Implementation: Institutional Arrangements; Knowledge Platforms, Ecosystem Based Management and Ecosystem Goods and Services. These are the themes that Ocean Governance will have to be formulated around in South Africa. These themes are likely to be central to ocean governance being implemented in regions and countries that wish to follow the internationally trending policy objectives, including those of multi-lateral agreements. Ecosystem-based management is ultimately the objective of the policy implementation and the other areas within the Pillar serve this approach. Note that EBM may have any selected combination or balance of intended outcomes across the range of benefits and services depending on the selected area management objectives.

The Issues within the First Theme of Institutional Arrangements are establishing a Decision-Making Authority and a Marine Spatial Planning Secretariat. The Decision-Making Authority is necessary, as this Authority must ultimately approve the Marine Spatial Plans. The South African MSP Act nominates several (11) Ministers into a Committee that must approve the Marine Spatial Plans. The Authority therefore has been decided and nominated, and this represents the first collection of Ministers as a designated unit for the approval of marine spatial plans in South Africa. The Authority must undertake the important function of setting criteria for decision making. Decision criteria are necessary to make consistent decisions on competing uses for marine spatial plans, and framing criteria. A recommendation on such criteria is recommended in Chapter Six. A legal expert among the key informants noted that the decisions around selecting and prioritising across planning options must be made on the basis of transparent guiding principles and criteria, and these must be applied consistently. Marine spatial planning must respond to perceived government priorities, as this is a government led and implemented mechanism. As a result, preferred management plans may change over time, as government priorities evolve. Criteria must include the objectives as set out in MSP Act: improve equitable access to oceans and coasts resources to previously disadvantaged groups; improve access to ocean resources in general to stimulate the ocean economy; develop the ocean economy; environmental conservation; pollution management; understand opportunities and threats from the ocean; and support international obligations (MSPA, 2019). The preceding Chapter Six dealt with political considerations that are peculiar to South Africa such as transformation, economic equity and economic empowerment of Black African People that were marginalised during apartheid over more than 300 years. A marine spatial plan can have these political dimensions combine in various ways. The Decision-Making Authority should work within a framework of targets, thresholds and limits. This will provide clear direction to the Authority and will make stakeholders aware of the strategies informing marine spatial plans. The concepts of indicators and thresholds are raised by the NEMO White Paper. The competing ocean sectors could then present their cases for responding to these thresholds, indicators, targets and strategies. Defined guidelines and criteria will provide some safety against decisions being legally challenged by sectors who believe their investment efforts and returns are being frustrated unfairly or inconsistently by a marine spatial plan.

The Decision-Making Authority must be supported by an adequately resourced Marine Spatial Planning Secretariat. The Secretariat must function to develop and implement the process of marine spatial planning across the various sector departments, especially with so many Ministries involved in South Africa. The Secretariat must also create the formal steps for stakeholder engagement, and be responsive to requests for information and participation from the government, industry, labour and civil society role-players. Stakeholder engagement around MSP was the primary issue raised by all key informants, and engagement processes must be defined between the Secretariat and the sector departments. The Secretariat must have clear guidelines as to the separation of functions and what are the roles of the various sector departments, and how such departments will undertake and fund their functions. The MSP Act does not establish a Secretariat, but does state that the Department of Environmental Affairs will chair the National Working Group. The Department of Environmental Affairs will have to ensure that this function is resourced, with roles and resourcing between itself and other sector departments being defined.

The Issues within the Second Theme of Knowledge Platforms represent critical basic information that will be required for the development of Marine Spatial Plans. The Issues include identifying all the necessary categories of basic data or information and potential sources of these. Once identified, access to the data must be negotiated. Access to information cannot be underestimated. Key informants associated with the development of the National Oceans and Coasts Information System reported that national departments charged with management of the various ocean sectors were reluctant to openly share data on the sectors, especially at very fine resolutions in time and space. This may stem from representatives of departments unsure of how the data will be used, and if it will result in their sector being compromised in the future. Induction and training into the MSP process may assist here. A real concern voiced by some industry representatives is that industry intellectual property and strategic planning may be shared in ways that will competitively disadvantage individual companies within sectors and across sectors. This may include future planning such as expanding a fishing fleet, or increasing the number of oil and gas exploration activities, including location and timing of these expansions. This will allow others to plan around such expansion efforts and business strategies. Such intelligence will also allow for lobby groups against sectors such as fishing or mining to build their arguments. The solution here will be to find that balance of sharing information at a resolution that will allow for meaningful marine spatial planning without compromising competitive advantages within and across sectors. These may include summarizing and averaging industry targets across sectors over suitable time and spaces scales - for instance, annual or five-year expansion targets, over a selected area of ocean space.

A further complication for sharing data in the South African context is that some departments do not have data gathering operations situated in the department but have state-owned entities that are operated as independent legal entities that must generate their income. The tendency for these entities is to charge for gathering and making data available. Such entities included the South African Maritime Safety Authority within the Department of Transport; the National Ports Authority within the Department of Public Enterprises; the South African National Parks, the South African National Biodiversity Institute and the South African Weather Services within the Department of Environmental Affairs; the Council for Scientific and Industrial Research and South African National Space Agency within Department of Science and Technology; and the Council for Geosciences within the Department of Minerals and Energy. These considerations at the national department level will also be repeated at the provincial and municipal levels when information is required at these levels. The Department of Defence is a special consideration in South African marine spatial planning. The Navy, as part of the Department of Defence, has jurisdiction of the ocean areas adjacent to South Africa and their uses must be included, including ammunitions dumps, space for training exercises and priority routes and uses of ports. The extent to which data sharing may be possible will have to be negotiated with the Navy and other organs of state. The MSP process will need to develop an information and data sharing policy. The MSP Act does provide the Minister of Environmental Affairs with the power to request data from departments as required for MSP, a transparent data policy will however provide departments with clear direction on how data will be collected and managed and how it will be used and shared. This will allay some of the concerns around data sharing.

Ideally the information must be available to all participants in the MSP process in the same way and through the same platform. This will, in the first instance, avoid planning occurring across different assumptions of basic information using various maps and mapping resolutions. Discussion will occur based on the same map, with all participants having equal access to the same information at the same resolution. Section 7 of the MSP Act requires that the Minister of Environmental Affairs designates a Marine Spatial Planning Knowledge and Information System. The Department of Environmental Affairs has over the last 5 years been developing the South African Oceans and Coast Information System. With some enhancement, this system is probably best placed to play this role. Enhancements will include building significant data storage capacity, and fast, cost efficient and stable internet connectivity across stakeholder departments.

Basic information for marine spatial planning will be required on marine resources, biodiversity, ocean industry sectors, social beneficiation, impacts of ocean sectors and areas of overlap. All of the information will need to be mapped onto the same map. Marine resources will include living and non-living resources. Biodiversity maps must illustrate areas of special concern such as protected areas, biological and ecologically significant areas, areas designated for rehabilitation and support areas for vulnerable species. These will be used in determining overlap with industrial use maps. Industrial use maps must contain existing footprints and planned expansion, so that future spatial implications can be included in the planning. Impact mapping must be as comprehensive as possible for both existing and future user footprints. Similarly subsistence; recreation; local community and cultural uses will have to be included in the mapping and planning processes.

The current form of the Oceans and Coasts Information System (OCIMS) that is being developed includes support knowledge tools of ocean industries. This is in addition to its mapping of the user groups and their impact footprints. These supporting tools are important to South Africa's aspiration of building the ocean economy through Operation Phakisa. Such knowledge platforms are a form of government subsidization towards facilitating the access of investors into the ocean space – as noted by an industry representative key informant. Ocean industry sectors would have had to pay for these services or tools themselves if these were not available through the OCIMS.

The Third Theme of Ecosystem-based Management (EBM) is included as a principle of the South African Ocean Governance White Paper and the MSP Act. Senior officials of the Department of Environmental Affairs interviewed in this study all agreed that management interventions and implications must be considered at the ecosystem scale. This allow for complete management considerations and responses at the appropriate scale.

Clear objectives for EBM will be required to focus policy implementation. These are provided for to some extent in the South African Environmental Management Policies, including the MSP Act which includes maintaining ecosystem functioning. This study interprets maintaining ecosystem functioning as maintaining the integrity of the ecosystem so as not to damage critical processes that result in benefits to humans. Ecosystem services and benefits are discussed as the Fourth Theme within this Pillar's description. Other defined objectives of these policies include promoting sustainable use and specifically the development of the ocean economy while assessing and addressing the impact of pollution. Marine spatial planning, through the specifically designated Act, is the identified mechanism for achieving ecosystem-based management in South Africa. During implementation of the MSP, interpreting maintenance of ecosystem integrity will occur at finer resolutions, where considerations will include threshold or ceiling limits of acceptable impact.

For South Africa, policy implementation at the ecosystem scale must include cooperation with the neighbouring coastal states. The shared marine ecosystems of South Africa were described in Chapter Five. From a governance context South Africa must engage meaningful on three fronts, the west coast – Atlantic Ocean, east coast – Indian Ocean and the Southern Ocean. The Benguela Current Large Marine Ecosystem on the west coast is most directly engaged through the Benguela Current Commission which includes Namibia and Angola. This system is also included in the Abidjan Convention which seeks to promote the integrated coastal management approach within countries of the west coast of Africa. There is no Commission relating to the Agulhas Somali Current Large Marine Ecosystem on the east coast, however the Nairobi Convention for countries of east coast of Africa has similar objectives to the Abidjan Convention. The Antarctic Large Marine Ecosystem is engaged with through the Antarctic Treaty System and the Convention for the Conservation of Antarctic Marine Living Organisms, which also has a Commission approach.

South Africa can achieve national advantage through policy alignment and coherence across regional objectives. This can be extended from regional to global initiatives such the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Convention on Biological Diversity (CBD). South Africa participates in a host of other multi-lateral arrangements such as the agreements within the Convention on Migratory Species (CMS) and the Convention on International Trade in Endangered Species (CITES)[8]. The national value proposition of all of these multi-tiered engagements will be enhanced if South Africa can align its positioning across these, and seek to coordinate interventions and actions in Benguela, Agulhas-Somali and Antarctic Systems. This alignment was not evident from the interviews with key informants. Alignments across these

[8] In addition to the environmental multilaterals, related multilaterals such as the in the maritime and pollution domains should also be considered for alignment across the regional ocean governance arrangements.

regional programmes could begin, for example, with coordinating objectives and or targets and common approaches in pollution management, sustainable use and agreement on maintaining ecosystem integrity or the use of MSP as a regional approach to ocean governance. This is further elaborated on in Pillar Six of the Concept Map discussed below.

The Fourth Theme in the Concept Map requires that the full range of benefits and goods be included in MSP. This is a complex concept, and a fuller discussion was provided in previous section – 7.3. While each of the industrial ocean sectors will provide a dollar or monetary value for their sector, the ocean, like other natural systems, provides a series of common good functions. These are not easily valued in terms of monetary value, and are often not overtly placed in the decision-making processes of spatial planning. This includes the conservation of biodiversity which is as an objective of ecosystem management in South Africa and other countries. The conservation and preservation of biodiversity will ultimately maintain ecosystem functioning and resilience through maintaining underlying ecosystem processes. Through maintaining ecosystem processes common good functions, benefits and services are maintained. These considerations must however be overtly included in MSP planning to avoid unintentional erosion of the common good functions. Marine ecosystem services that are beneficial to humans include climate regulation, storm surge protection, waste disposal and recycling of nutrients. The have several layers of implications for human health and well-being including food production security; livelihood opportunity maintenance; trade facilitation; disease exposure; and flooding, drought and soil erosion vulnerability. The consideration here is not that these implications are entirely prevented but that such incidents might begin to occur with increasing variability, uncertainty or change in dynamics, making local communities and governments increasingly unprepared.

Pillar Six combines Specifics from the preceding Pillars into Emerging Considerations that are particularly relevant to the South African context. This Pillar formulates specific considerations for ocean governance in South Africa, and includes concepts that were not easily included in the conceptual flow of the first five pillars.

The most dominant idea emerging from both the key informant interviews and the discussions from preceding Chapters is stakeholder engagement and consultations in MSP. The MSP Act does include consultation but does not specify mechanisms for it, only that it must be done with the relevant government sectors, representatives of affected industries, representatives of organisations of affected persons and the general public. The Act stipulates that sector departments must consult their sectors, and include such information as part of the sector input into MSP. The implementation of the MSP process in South Africa will have to clearly identify the points of stakeholder engagement and access to the process.

Interviewees from other government departments outside the Department of Environmental Affairs were concerned with how their inputs and ambitions for their sector would be expressed in the marine spatial plan. They noted that Environmental Affairs is itself a sector Department and is perceived as championing the conservation "use". This championing is expressed through area-based management interventions, especially Marine Protected Areas that are zoned to limit industrial impact on marine ecosystems. The Department of Environmental Affairs is then definitively defined as a spatial player in marine spatial planning. This was highlighted by interviewees drawing reference to the Department of Environmental Affairs gazetting a new and expanded network of 20 Marine Protected Areas outside and parallel to the MSP process. Interviewees expressed that Environmental Affairs may argue that it is safeguarding the common good functions of the ecosystems, however the opinion expressed was that these must be included in the trade-off discussions. This is especially true in developing countries where ocean industrialization has not been active in high volumes, and as a result, the majority of ocean ecosystems are in a relatively pristine state. If there is a stated objective of maintaining ecosystem functions at existing levels, this leaves very little room for ocean industry sectors to expand from the current low base. Departments therefore wanted to maximise consultation and engagement at every level of marine spatial plan development, so that these issues could be discussed transparently, especially if the process of MSP is coordinated by the Department of Environmental Affairs.

Similarly, interviewees representing industry sectors expressed the view that they wanted a detailed plan around shareholder engagement and consultation. Industry players wanted access to decision makers at the highest level, as they felt that industry is best placed to make their arguments and present their cases rather than the sector government departments that represented them. This sentiment was expressed especially with regards to the Department of Environmental Affairs, who industry thought would focus on an impact argument rather a benefits argument. Interviewees noted that the MSP Act was created as a deliverable in the Operation Phakisa: Growing the Ocean Economy Programme. This allowed for an interpretation by industry representatives that marine spatial plans must prioritise economic growth and social beneficiation. The question of how this was going to be incorporated into the development of marine spatial plans and decision criteria for prioritization of economic activity over or with conservation was raised. The MSP Act does set sustainable economic growth of the ocean economy as an objective. There is a need for an overt acknowledgement that this will mean an increase in impact on the ocean ecosystems away from existing levels. The sustainability component of the MSP Act will require that this impact must be at a level lower than thresholds that will change the underlying processes and functioning of the ocean ecosystems.

Interviewees recognised that a key aspect of the MSP process is that all parties are encouraged to present their arguments, and it allows for overt and transparent decision-making. It is also recognised that the South African MSP process, included all affected Departments through the Directors' General and the Ministers' Committees. This is reflective of the broader South African governance approach of full consultation which brings with it the necessary administration and time costs. These costs can be considered as investments into processes and products that are ultimately more acceptable and implementable.

Marine spatial planning and coordinated ocean governance in South Africa is relatively new. Several interviewees expressed the need for officials in the various sector government departments to be inducted and trained into MSP. An additional concern expressed was that sector departments were adding this function to officials with existing portfolios of work, without reviewing the business operation implications such as the creation of new staff positions or additional budget to outsource the collection of sector data or the resources and logistics required for stakeholder engagement. The capacity requirements for marine spatial planning will have to be acknowledged and addressed if the MSP Act is to be implemented. There is at present both enablers and constraints to stakeholder participation in the South African Ocean Governance context. The policy directives, especially the prevailing interpretation on South Constitution of an inclusive people's government and the specific requirements of Marine Spatial Planning Act, set legislative enablers for engagement. Similarly, the nomination of a responsible national Government Department and creation of the National Marine Spatial Planning Committee provide enablers for coordination and interdepartmental collaboration and negotiation. Similar specific engagement, communication and co-management mechanisms for engaging the public and specifically impacted communities and local government structures still need to be established and at present this must be seen as a constraint.

A specific concern related to transboundary or cross border ecosystem management was trade certification. As discussed in Chapter Six, the demersal fishery in South Africa has Marine Stewardship Council Certification. Chapter Five described that recent studies have shown that there is some sharing of the hake stock between South Africa and Namibia. Certification allows for South Africa to export to the European Union. When this stock is recognised as a shared stock the joint management and assessment procedures of the stock will have to be evaluated for certification. The South African industry will not want a break in their ability to export to lucrative markets, so the transition from independently managed to joint management must be negotiated and planned to avoid such a break. This will be required if the fishing industry of South Africa is to support an ecosystem-based approach and joint management of the shared stock.

The opportunity for South Africa to promote regional and international ocean governance is again emphasised in this Emerging Considerations column, following the discussion in Chapter 5 and within the description of the Pillar Two Theme of Ecosystem-Based Management. Considering that South Africa participates in regional seas programmes that include the continental east and west African coastlines, and the Southern Ocean, it does have the potential to impact policy direction and cohesion over a very large percentage of the planet's ocean.

These regional programmes also allow South Africa to engage with regional countries and with developed countries including Europe, Asia and North America through the Antarctic Treaty System. South Africa can use these engagements to cooperatively develop ecosystem thresholds for large marine ecosystems or common approaches such as status reporting, treatment standards of sewage, or the non-use or non-discharge of persistent organic pollutants into coastal systems. Such approaches can also be extended to global policy initiatives such as: the no-fishing beyond certain depths or habitat types; reduction targets for plastics disposal; improved recycling, or regionally coherent approaches to ocean geo-engineering.

The United Nations Convention for Biodiversity (CBD) will at the 15th Conference of Parties again set targets for the conservation and protection of biodiversity. This was done before in 2010, see Chapter Three. Only one of the 2010 targets is likely to be met by 2020 by several countries - the 10% protection of marine and coastal habitats. It is likely that another target of this nature will be set. South Africa should consider what will be nationally beneficial on this and other targets and then seek to strategize and seek cohesion and support within the regional forums that it participates in. Such a coherent approach will link distal and proximal drivers, influences and impacts across global, regional and national levels.

Over the last 5 years, there has been an increasing coming together of the policy statements of the CBD and the United Nations Framework Convention on Climate Change UNFCC. This is illustrated in the 2019 report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) which described the direct and indirect linkages that are shared across ecosystems, ecosystem services and human well-being including in aspects of climate change (Díaz et al., 2019). The CBD has for several years produced dedicated working documents and decisions directed at Marine and Coastal Biodiversity, while the UNFCCC has increasingly featured the ocean and its planetary regulatory and support roles. The 25th UNFCCC Conference of Parties took place in Spain, in December 2019 and continued with increasing deliberations on the role of the ocean, with a focus on Blue Carbon. Blue Carbon generally refers to the role that ocean ecosystems, and in particular coastal wetland habitats, have in removing and storage of atmospheric carbon (Howard et al., 2014). The impact of a changing climate on the ocean and the ocean's returning influence on the planetary climate system was further highlighted in the report of the Intergovernmental Panel on Climate Change (IPCC) titled 'Ocean and Cryosphere in a Changing Climate' (Pörtner et al., 2019).

The regional ocean governance forums and the international platforms can also play a role in promoting the development of the ocean economy. Aspects of this are being demonstrated by the Indian Ocean Rim Association (IORA). While the Benguela Current Commission, and the Abidjan and Nairobi Conventions have their basis in environmental management, the IORA seeks to facilitate broader economic and socio-economic progress of the countries bordering the Indian Ocean. Regional ocean economy growth at present has several limitations and challenges from port infrastructure to trade barriers (Wignaraja et al., 2019). Functional ocean governance forums can be used to address these challenges. Generally countries have government representatives from a range of relevant sector departments participating in these regional forums, such as the BCC. Such negotiating teams provide a platform for understanding cross sector frustrations and how to frame desired solutions across national departments. Regional ocean governance fora could then be used to identify challenges and solutions to growing the ocean economy regionally, which can also have the benefit of coordinated compliance monitoring.

A final collection of ideas in Pillar Six revolves around community and people values associated with the ocean that cannot be spatially resolved, such as closeness to coastal environment, social and religious sense of being. These are concepts that cannot be resolved through allocating space to activities as communities have a desire for interacting with coastal environments that are as close to their natural state as possible. Government officials interviewed expressed an appreciation of this through their interactions with communities. Their current response to this desire is that these "non-spatial" benefits may be addressed through avoiding clustering activities into the coastal space but rather trying to offer these communities a sense of openness and wilderness. In reality, this is only possible in more remote areas of the coast, far outside industrial ports and urban areas.

7.5. Conclusion: Context for Implementing NEMO

The South African Ocean Governance Policies like other natural environment policies sets its vision on sustainable development. For South Africa, this vision is set against redressing the devasting and still evident impacts of apartheid. This fundamentally includes redressing the distribution of wealth and takes the material form of growing the ownership of business and wealth by Black People. Marine spatial planning as the delivery mechanism for ocean governance in South Africa must find a way to include this redress and equitable beneficiation of marine natural resources. Marine Spatial Planning should also promote that Black People share equitably in the services and benefits beyond the provisioning services such access to clean recreational and religious coastal sites. Apartheid was implemented as a spatial planning exercise and often removed coastal people from access and closeness to the coasts and ocean, and government policy now seeks to redress this, as directed, albeit broadly, in the White Paper and Marine Spatial Planning Act.

Marine spatial planning is the latest spatial governance regime now being implemented in South Africa. Under the current Constitution, through its Bill of Rights, that places people freedoms first, there is a high level of participatory governance expected both from government officials and from citizens. It is therefore realistic that stakeholder engagement and participation featured as the principal issue to be considered in the implementation of marine spatial planning during the interviews in this study.

The inherent and advertised value of marine spatial planning is that it allows for inclusive, overt and transparent decision making. This will have to be exercised optimally and in a balanced way to be as inclusive as possible while still moving the process forward. Greater transparency will be achieved if the decision criteria for the spatial plans together with government priorities are publicly available.

The success of a well-constructed marine spatial plan and its implementation must be measured against pre-set criteria. In the case of South Africa, the development of the ocean economy is a defined objective in the Marine Spatial Planning Act. Operation Phakisa: Growing the Ocean Economy programme has defined targets for ocean sectors. These could be used to measure success. Contribution to GDP can also be used to measure ocean economic growth, however improved ocean industry economic characterisation and classification will be necessary to collect data at meaningful resolutions. Better classification and data collection will avoid the use of methods such as described in Section 7.3 above that ascribe a portion of existing (largely terrestrial) industrial sectors to the ocean economy. Additionally, ecosystem service values will need to be determined and tracked so that changes in these can be monitored (Colgan, 2016). Monitoring economic and ecosystem service valuations will allow government and management interventions to adjust towards strategic objectives, such as higher economic return or lowering negative impact on ecosystem services. Economic, social and nature-based ecosystem observations collected and analysed in parallel and together will demonstrate the interdependencies between humans and natural systems (Costanza & Liu, 2014).

Developing discussions around marine spatial planning using monetary terms directly responds to the context for ocean governance in South Africa. This South African context is heavily weighted towards developing the ocean economy. Citizen and political support will be required to sustain the implementation of marine spatial planning. The inclusion of monetary valuations for ecosystem services, benefits and goods allows for a common platform to start discussions across industry, labour, civil society, government and communities. The monetary evaluation of ecosystem services provides for a discussion on the value of ecosystem services to human beings. This discussion process allows for an appreciation of the level of reliance that coastal communities, as well as the national GDP have on the supporting and regulating services of the coastal and ocean ecosystems. This study's estimation of the value of ocean and coastal ecosystem at just over four trillion rand is an entry point into discussions of the importance of maintaining the integrity of marine ecosystems. Four trillion rand approximates the entire annual GDP of South Africa. The World Bank estimation of South Africa's GDP in 2018 was 368 28 billion US$[9]. This equates to ZAR5.52 trillion, at early 2020 rand/dollar exchange rates. Such valuations allow for conceptualizations that link the maintenance of the integrity of marine ecosystems and natural processes to the return of benefits to the country that are valued in the trillions of Rands.

Generally, all global policy advocating groups like the CBD, UNFCCC, IPBES and IPCC are urging governments into urgent, joint, coordinated and cooperative action to mitigate risk to ecosystem services. This call to action includes understanding, forecasting and preparing for changes in ecosystem services that have already began. International policy directions, like national imperatives such as the building of the ocean economy, is a reality of the ocean governance context for South Africa. To achieve this cross-forum and regional alignment of policy or negotiating imperatives, South Africa must first define and prioritise those thresholds and limits that will most significantly support its ocean governance objectives. These imperatives can include aspects of biodiversity, planetary (and ocean) temperature,

[9] From: https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=ZA

pollution, harvesting, trade, and ocean acidification. South African can promote these policy directions at the global forums and seek partners, investors and implementors at the regional and local ecosystem levels. Additionally South Africa can seek to influence the science and knowledge generation agendas of these regional forums, and in doing so fulfil some of its urgent needs such as understanding what if any are the relationships between ocean conditions and severe weather (droughts and floods) for South Africa and southern Africa, or social beneficiation of goods and services from its shared large marine ecosystems.

The ocean governance context for South Africa is complex. It contains a National and International dimension. Nationally the outcomes must address economic development, and must deliver both increases in the GDP and job creation. The pressure to grow the ocean sector cannot be underestimated. South Africa's economy has slowed and in the third quarter of 2019 was looking like slipping into recession, with the possibility of two successive quarters of contraction (Stoddard, 2019)[10]. Unemployment in the third quarter of 2019 was reported by Statistics South Africa to be at 29.1% (Statistics South Africa, 2019b). The Statistician General of South Africa who published the Inequality Trends Report in November 2019 reported that South African continues be to one of the most unequal countries in the world, and much of the inequality is still along racial lines (Statistics South Africa, 2019a).

With unemployment, and inequality growing in South Africa, there is increased demand that Government deliver economic growth (Burger & Calitz, 2019). This growth is targeted towards improving job numbers, and simultaneously transforming wealth ownership to be more inclusive of Black South Africans (Tshishonga, 2019). The South African Government is justified in looking to the oceans to do this. The large volume of ocean space adjacent to South Africa forces the idea that the ocean must be seen as a major player in the economic growth of the country. Operation Phakisa: Growing the Ocean Economy Programme has

[10] Economic recession in South Africa has been confirmed in April 2020, with the Corona Virus pandemic being a significant contributing factor to an already struggling economic outlook.

promised to deliver significant strides in the ocean economy through marine spatial planning. This programme will be judged by its products from 2020 - which will signal the first five years of its implementation as a big fast results initiative.

Internationally, South Africa must prioritise a set of strategic negotiating positions that best serve the national objectives, and support the maintenance of ecosystem services that South Africans enjoy. Erosion of these ecosystem services will have negative consequences for people living along the coast directly and indirectly for entire populations of coastal countries. Economies of coastal countries will become impacted through erosion of natural capital and diminishing economic services. Coastal countries will face real and immediate costs of covering the expenses of emergencies in natural disasters and the erosion of people's ability to provide livelihoods for themselves. Disasters may be sudden and acute, such as coastal storm surges and flooding with their food, water and disease implications or gradual and chronic such as the gradual decreasing of coastal water quality, micro -plastic pollution in fish, increases in ocean acidification and oxygen depleted zones.

The outcomes of ocean governance in South Africa must be delivered through transparent, inclusive and people centred processes. This is the primary finding of this study. Democracy, achieved in 1994, is still a fresh concept in South Africa. For the many dispossessed Black South Africans there has been much progress since 1994 however, across the stakeholder categories, people want to feel as though they are being consulted and that they are being heard (Friedman, 2019). Ocean governance and marine spatial planning must be implemented through processes that respond to this need for meaningful engagement. Ocean governance and marine spatial planning is unfortunately being delivered and developed in an economy that is slowing dramatically. There is pressure on the Government of South Africa to deliver the ocean economy quickly.

8. Conclusion: A Conceptual Framework for Implementing Ocean Governance and Marine Spatial Planning in South Africa – Summary of Key Findings and Recommendations

8.1. Introduction

This study of Ocean Governance Implementation in South Africa aims to offer recommendations on the implementation of ocean governance policy in South Africa. The study implemented an Optimal Grounded Theory approach. Optimal Grounded Theory is an approach that was previously used in studies aimed at offering policy and policy implementation recommendations for application in real world contexts. These studies also used document analyses and reviews, as primary data sources (Richards & Farrokhnia, 2016). While the Optimal Grounded Theory was the operational approach of the study the conceptual framing of the study was within the Phronetic model of social research described by Flyvbjerg (Flyvbjerg, 2001, 2012).

To achieve its aims, the study sought to define the context for ocean governance in South Africa, and specifically to define this context for marine spatial planning (MSP), which has been identified as the principal delivery mechanism for ocean governance. To offer a value proposition to the real-world implementation of the ocean governance, this study identifies critical elements or steps that will be required to implement MSP in South Africa. The concepts were traced from the their original conceptualization from the Ocean Policy Green Paper published in 2012, to the White Paper in 2014 and the Marine Spatial Planning Act published in 2019. The study was undertaken during the evolution of the policy and provided an opportunity for an in-depth case study of ocean policy development and implementation.

Even in Optimal Grounded Theory methods, the basic criteria of the Classical Grounded Theory remain. These basic criteria are <u>Fit</u>; <u>Understandability</u>; <u>Generalizability</u> and <u>Control</u> (Evans, 2013). This study has produced two overarching conceptual frameworks that are offered for assessment by future studies and applications with regards to how they: Fit the substantive area of Ocean Governance; are Understandable to a range of practitioners in the substantive area; have sufficient Generalizability so that they can be applied to a range of situations and scales in ocean governance in general and to marine spatial planning in particular; and are flexible enough to allow potential users some Control over them so that users may apply and modify these frameworks in their particular applied situations and future studies.

The two over-arching conceptual frameworks emerge in Chapter Seven and in this Chapter, Chapter Eight. Chapter Seven presented a Concept Map that describes the ocean governance context in South Africa. This Concept Map includes the findings from preceding Chapters and provides much of the basis for the discussion in this concluding Chapter. Chapter Two presented an initial framework for this study that illustrated the major areas of investigation. This is revisited in this Chapter to illustrate the major leanings of the study and is presented as a Recommended Framework for Implementing Ocean Governance in South Africa – Figure 25. Before discussing this emerging framework, a brief summary of the discussions and conclusions from the Chapters Three to Seven is provided. The Chapter summaries aim to describe the dominant conceptual threads in each Chapter.

8.2. Summary of Chapter Discussions & Conclusions

Chapter Three concluded that the South African Green and White Papers on Ocean Governance generally reflected trends featured in other country national ocean policies, and also reflected trends in global multi-lateral forums. An area that could have been added to the South African Ocean Policy was around citizen engagement and lifelong learning on ocean matters relating to conservation, earth science and resource utilization. This included knowledge building on new sectors that can be accessed and exploited through technological advancements. Other country national ocean policies reflected strong nationalist agendas around building economic advantage that was not as prevalent in the South African policy documents, which tended to have a conservation bias. The South African Marine Spatial Planning Act does offer a better balance than the Green and White Papers between the conservation and sustainable development or ocean economy concepts. Chapter Three also recognised that strong, adequately resourced institutional arrangements will be required to implement this new area of governance. Regarding global ocean governance agendas, Chapter Three noted that while the South African policies did discuss aspects of the role of the ocean in planetary functioning, clearer statements of intent could have been developed around climate change and the role of ocean conservation. These ocean aspects have been attracting higher levels of attention at the recent Conference of Parties of the United Nations Framework Convention on Climate Change.

Chapter Four summarised that South Africa follows the general global trends of producing more marine science output in the natural sciences and predominantly on marine ecosystem health. To meet the national ocean economy objectives more science output will be required in both engineering and technology support for ocean industries, as well as producing knowledge on thresholds and environmental standards for these industries. Routine economic and equally urgent, social data collection and science programmes are required to assess economic progress and social beneficiation of the planned ocean economy. While biodiversity, physics and chemistry presently enjoy relatively large funding and attention by research agencies in South Africa, there are no routine national indices produced for any of the ocean variables, with the notable exception of seabirds and seal long-term populations trends. The National Biodiversity Assessments produced every five years aims to collate biodiversity information, including aspects of change and species loss, however effort will be required to develop national indices that can be used to track marine ecosystem variability and change. South Africa does require its current and future ocean science investment to be implemented and coordinated around a core set of defined essential variables, which must include economic and social data parameters.

Chapter Five concludes that the Benguela Current Convention, and the Commission that it established, is a positive regional contribution to Ecosystem-Based Management (EBM) of the Benguela Current Large Marine Ecosystem. It provides for a regional, ecosystem-wide legal framework, for management discussions and gives direction to regional science and monitoring programmes. For the Commission to be effective at implementing EBM, it must better frame its transboundary role, and make transboundary management decisions that can be implemented through the three participating countries. The relationship of the three countries, including their participating national ministries with the decisions of the Commission must be developed to improve clarity and expectation of implementation. This can be efficiently achieved through some operational decisions on transboundary management interventions. South Africa can achieve aligned, coordinated and cohesive influence over a large planetary ocean space through coordinating its positions across the governance structures of the three Large Marine Ecosystems that it participates in: the Benguela, Agulhas Somali and the Southern Ocean.

Chapter Six describes a South African ocean and costal space that can potentially be quite busy with several layers of overlap across several existing and potential new user categories. These will increase with technological and engineering advances. At present South Africa does not enjoy a large ocean economy relative to its terrestrial industrial sectors. The development of the ocean economy is being addressed through the rapid development programme of Operation Phakisa. Overlapping ocean sectors can compete or support each other depending on input requirements to sector operations and functioning.

Decision Trees and evaluation criteria are offered for MSP processes in Chapter Six. The Decision Trees offer a logical stepwise approach to determining if an activity can be included in a marine spatial plan and if activities can coexist. It must be appreciated that decision criteria and their assessment are subjective choices that will be nominated, selected and evaluated by government officials as they interpret the mandate given to them. Strategic objectives and perceptions of sectors are subjective and can vary across stakeholders.

Chapter Six concludes that implementing an ocean governance model in South Africa will require some investment in institutional and supporting structures.. Marine spatial planning will be reliant on sector departments working together, and their efforts are to be coordinated by the Department of Environmental Affairs. The DEA coordination role will have to be defined in parallel with its conservation role in the MSP process. User profiles of the various sectors will have to be mapped on a central, easily accessible information system to allow cross sector planning and decision making. Chapter Six identifies that decision-making criteria and processes will have to be clearly articulated, communicated and consistently implemented. This will allow for a transparent process in which all of the sectors can fully participate.

Chapter Seven undertook its discussion into two broad themes: broadening the interpretation of ocean goods and services and defining the ocean governance context in South Africa.

Chapter Seven motivated that an appreciation of the total range of services and benefits derived from ocean and coastal ecosystems will be necessary to fully evaluate options for marine spatial planning. This will be needed to avoid maximising short term provisioning gains over longer-term ecosystem supporting and regulating gains. Even if the short-term gain option is selected at specific sites, it must be selected overtly, with an appreciation of knock-on impacts.

Chapter Seven estimated the value of South African ocean and coastal ecosystems to be between ZAR 2.1 and ZAR 4.1 trillion, depending on how one groups marine ecosystem types. The large numbers associated with ecosystem services are impressive but have limited practical value, and cannot be seen as tradable values. Such valuations are best used to attract attention and initiate discussion and debate on ocean governance issues. The process of evaluation has its own value of exposing otherwise hidden common good ecosystem services. The uses and impacts of such monetary valuations were also discussed in Chapter Seven, together with reviewing conceptual frameworks of ecosystem services and benefits.

Chapter Seven developed a Concept Map for the South African Ocean Governance context. This Map expanded on themes with increasing resolution to illustrate a comprehensive set of considerations for the implementation of Ocean Governance and Marine Spatial Planning in South Africa.

8.3. Concluding Recommendations for Implementing an Ocean Governance Policy for South Africa

In responding to the National and International dimensions of the ocean governance context, South Africa must implement governance methodologies that are transparent and inclusive. The traditional compliance, enforcement and policing methods must be balanced with people centred approaches. Figure 25 is based on the Conceptual Framework presented in Chapter Two and summarises the recommended implementation model for ocean governance and marine spatial planning in South Africa. Figure 25 has three columns of information below the top three category titles of: Ocean Governance Context in South Africa; Critical Success Factors for the Implementation of Ocean Governance Policies; and Recommended Actions. The detailed description below Figure 25 outlines considerations and recommendations within the three categories

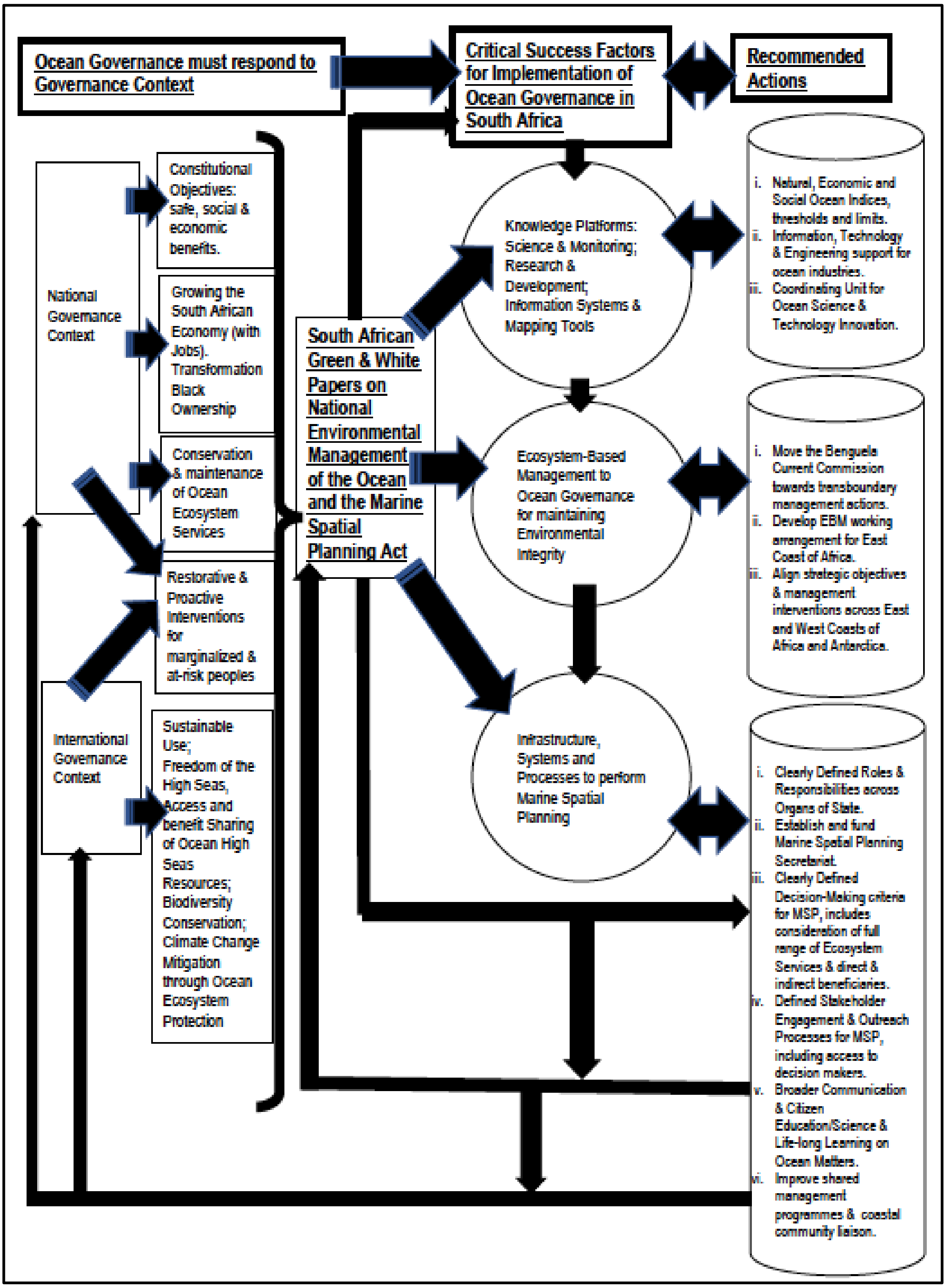

Figure 26. Recommended Framework for Implementing Ocean Governance in South Africa

The Ocean Governance context is driven by national imperatives and international agendas. While South African national imperatives are developed within the country and driven by the executive and national departments, international agendas are developed through the multi-lateral, often United Nations-linked, processes.

The National imperatives for South Africa are largely defined by its economic growth trajectory which is reaching catastrophic levels of decline. This is compounding the existing high levels of unemployment. The underlying political and social imperatives within the country demand that the ocean ecosystems contribute to economic growth. The successful implementation of environmental governance policies that only have a preservation and conservation focus is extremely unlikely. Consequently marine spatial plans will be made to address and stimulate economic growth as these plans pass though the formulation processes outlined in the South African Marine Spatial Planning Act. These processes include Committees of department experts, the Directors General Committee and an approval Committee of Ministers – all of whom must show action on economic growth and job creation. Policy implementation must be delivered within the constitutional objectives that the environment must be used for the benefit of society, while also being maintained as safe for the people of South Africa – albeit within the broad interpretation that this allows.

Traditionally international ocean issues were very focused on fisheries, allocation of shared and transboundary stocks, distant water fisheries and Illegal, Unreported, Unregulated Fishing. Recent global agendas feature a much broader range of issues such as biodiversity loss, climate change and adaptation, severe weather, changing ocean ecosystems through increasing temperature, fresh water inflows, rising acidity, pollution, ocean engineering and carbon capture and storage as climate change mitigation options. Access and benefit sharing of high and deep-sea resources, including chemical, biological and genetic resources have been added to, if not overtaken, the debates and discussions on shared fish resources. While at the local level there are some specific instances of declining impacts on ocean ecosystems, globally all measures of impact are increasing (Halpern et al., 2019). South Africa must engage these agendas and choose to what level it wants to invest in shaping these agendas through its various engagements. South Africa must decide through which governance mechanisms it wants to respond nationally and regionally to such global agendas.

An overlapping area in the National and International context is that of addressing marginalised and at-risk peoples. In South Africa marginalised people will primarily refer to those coastal communities that suffered from apartheid policies, removed from coastal areas and denied access to and ownership of marine resources and related businesses and industries. Internationally this will include peoples marginalised in a similar manner by colonising states, illegitimate governments, or distant water fishing nations. At-risk peoples will also include those people and communities that are at risk as a consequence of changing ecosystems that negatively impact the state of and access to marine ecosystem services. These impacts may include diminishing fish stocks and other negative impacts on food security, soil erosion, coastal flooding, increased exposure to disease, sea level rise and severe weather. All South African policies since democracy in 1994 have the intention of redressing the economic and social injustices of apartheid, and this sentiment is specifically included in the Green and White Papers on Ocean Governance. Internationally global conventions on biodiversity conservation and management and climate change specifically set objectives on creating proactive interventions for people dependent on nature for livelihoods and communities at risk through biodiversity loss and climate change (IOC-UNESCO and UNEP, 2016; Díaz et al., 2019).

The Critical Success factors for successful implementation of Ocean Governance in South Africa can be categorized into three areas: Knowledge Platforms; Implementing the Ecosystem-Based Management to Ocean Governance; and Infrastructure, System and Processes to Perform Marine Spatial Planning.

Knowledge Platforms include building a comprehensive science programme that must continue to encompass natural science while building investment in economic and social data collection and analysis capacity. Social and economic monitoring and science have lagged behind in the assessment of marine ecosystems in South Africa, where the concept of the socio-ecological system remains relatively underdeveloped (Mouchet et al., 2014; Harris & Lombard, 2018; Marshak et al., 2017; Link et al., 2019). These science programmes must develop national and local indices that can allow for trend analyses to determine changes and variability across natural, social and economic functioning of South African ocean and coastal ecosystems. Such science programmes will be required to assess and compare scenario options for marine spatial planning, and can be used to determine how and where ecosystem services, benefits and costs will accrue over different time periods.

The concept of Essential Ocean Variables as an efficient means to track ecosystem variability and change is discussed in Chapter 4. The Essential Variables concept has been extended by Reyers and team to a set of Essential Sustainable Development Goals Variables to monitor the variability and change in socio-ecological systems (Reyers et al., 2017). These measurements can be used to track progress towards achieving the Sustainable Development Goals (SDGs). Such a system of Essential Variables could serve as a set of indices that South African marine science investment can be coordinated against. It will be important that measurements of progress towards the SDGs are made in addition to the descriptive data from observations on climate, environmental and social parameters. Measurements of progress will track the intended transformational change that are desired by the SGDs.

In addition to the measurement of observations of socio-ecological systems and their change, South Africa must invest in ocean industry support with regards to technology and engineering development. This is needed if South Africa is to develop locally owned ocean industries beyond the traditional sectors of fishing and diamond mining. Locally produced ocean technology advances could be one of the indices that can serve as a measure of transformational change. The expansion of the ocean economy has been described as the expression of the marine dimension of the global new technology economy (Wenhai et al., 2019).

The recommendation on critical factors to implement ocean governance includes mapping and information system tools. Ultimately the marine spatial planning processes will need to resolve decisions into spatial distribution, and hence a coordinated single mapping system will be needed. For the scientific output to be available for the marine spatial planning processes, data and information must at some point be mapped so that synergies and conflicts can be assessed and evaluated. The advantages of mapping of user areas, conflicts and trade-off analyses have being identified by MSP practitioners in several locations (Lombard et al., 2019a)

South Africa at present does have investment in ocean and coastal sciences within national departments, national research agencies and at universities. The broadening of active disciplines and structuring of outputs as indices or other scalable knowledge products that can be used by ocean sector departments requires planning and coordination. The concept of transdisciplinary research is also mooted as a way of conceptualizing the bringing together of the traditional science disciplines to provide the integrated knowledge base that MSP processes require.

Transdisciplinary science programmes span across sectors, time and space. Transdisciplinary approaches are required to fully assess the production ability, state, accessibility and appreciation or value associated with ecosystem services. These are subjective conceptualizations that can be perceived differently across sectors and stakeholders (Costanza et al., 2017; Tolvanen et al., 2019). A nationally convened Ocean Sciences Planning Council would be able to achieve this broadening and fusion of the science, and consolidate existing and planned investments. Potential Departments to host this could be the Department of Environmental Affairs, with its existing role as coordinator and champion of the MSP processes or the Department of Science and Technology, with its general mandate to support national science initiatives. Marine Science Coordination could also serve as a standing agenda item of the Directors-General Marine Spatial Planning Committee as established by the South African Marine Spatial Planning Act.

The second critical factor for ocean governance is the implementation of an Ecosystem-Based Approach. Governance aimed at maintaining and promoting ecosystems that are safe and continue to provide ecosystem services and benefits across generations must be implemented at the ecosystem scale, including where this means management coordination across country borders. This is required so that interventions can be focused, coordinated, coherent and not place national and regional programmes at odds (Gonzales et al., 2019; Sherman et al., 2019). Attaining global climate change policy objectives requires the harnessing of positive learnings from successful local programmes so that their impact can be optimised at the national and regional scales (Gattuso et al., 2018). South Africa's geographic location places it at the confluence of the southern Indian, southern Atlantic and the Southern Ocean. South Africa participates in a range of regional ocean and coasts organisations, and through aligning its objectives across these organisations, it can exercise influence over the management of the Indian, Atlantic and Southern Ocean.

Processes to perform marine spatial planning is the third area of critical success factors required for the implementation of ocean governance. Marine spatial planning is very much a balancing of various industrial and social sectors to meet the objectives of government. Industrial and social sectors are represented through several government departments, industry and civil associations. In South Africa, government representation can occur at the national, provincial and local or municipal level. The national legislation in South Africa allocates the governance of the area below the high-water mark as a national department competence. Coastal (above the high-water mark) planning, including social and economic infrastructure is allocated to the provincial and municipal tiers (ICMA, 2009). There is then the need to have an operational approach to define the roles horizontally across national departments and then vertically through the tiers of government. This is particularly important for the Department of Environmental Affairs which is tasked with driving the MSP processes. The MSP function will need to be formalised within this Department and funded, including with dedicated human capacity. The study recommends that this function must ideally be clearly separated from the Department’s conservation role. Conservation imperatives must be motivated on their responsiveness to government objectives like the other ocean industry sectors, or else this may create the impression of other sectors reacting to an already sanctioned conservation agenda. The study in Chapter Seven articulated that MSP strategic objectives and decision criteria must be transparent. In South Africa all policies and implementation programmes will have to address the job creation and growth of the economy. The methods of delivery of these objectives must include social restorative justice for apartheid affected people by broadening ownership of and participation in economic sectors to include Black and Female individuals. MSP must ideally incorporate the full range of ecosystem services in these transformative processes, from provisioning to the more indirect benefits of regulating, supporting and cultural services. Decision makers must be aware of the time period over which MSP decisions will be made regarding the return of benefits. Provisioning benefits are likely to have much more of an immediate return of benefits, whereas the erosion of ecosystem and climate services will take longer periods and the impacts of this may only be realised over multidecadal time periods.

Marine spatial planning is a government driven spatial planning process and cannot be separated from the governance context. Any governance intervention must serve the objectives of the ruling government, and in democracies, this is perceived as serving the will and desire of the citizens. Government process and officials can either provide enabling or frustrating conditions for marine spatial planning (Mahon & Fanning, 2019b). This will depend on how closely MSP objectives and processes are aligned to government objectives. Government objectives will not only influence MSP implementation within the National EEZ but also influences how ocean governance is undertaken regionally. Bilateral and multi-lateral relationships will impact the extent to which transboundary and regional MSP objectives can be achieved (Mahon & Fanning, 2019a). The reviews of regional ocean governance by Mahon and Fanning illustrate this by presenting a case that regional governance structures could be seen as forming supporting concentric circles of governance that can be promote the delivery of global governance objectives as well as providing support for national objectives. Gonzales and co-authors described several areas of successful collaboration in promoting regional marine ecosystem governance across countries in East Asia (Gonzales et al., 2019). These successes relate to the critical need for effective and operational bi- and multi-lateral relationships to implement the marine ecosystem-based management.

A primary finding of this study is that implementing MSP within South Africa must include a high level of stakeholder consultation. Stakeholder consultations must be defined within the MSP processes. Ideally stakeholders must have access to officials at the technical levels and also in the decision-making structures. Stakeholder engagements must occur with business and industrial sectors, labour, affected communities and civil society organisations. These engagements are in addition to the formal MSP engagements and negotiations across national, provincial and local or municipal government departments and officials.

The critical role of stakeholder contributions to the creation and management of large scale marine protected areas were identified in the Think Tank on Human Dimensions organised by Christie and co-workers (Christie et al., 2017). The authors argue that the best practice approaches emanating from the Think Tank of transparency, participatory and culturally-appropriate management of large MPAs are applicable to ocean governance generally. Stakeholder engagements are used in MSP processes as a means to determine societal or human aspirations. The MSP processes must fully include these observations and knowledge as a dimension of the spatial plan that will be finally produced. Full inclusion of the social dimension in MSP is increasingly being argued not only as fundamental to its successful structuring and implementation but is also ethically required (Grimmel et al., 2019). Grimmel and co-workers review of methodologies to achieve social inclusion in MSP described tools such as Citizen Science Programmes and Social Impact Assessments. While Environmental Impact Assessments and more recently Economic Impact Assessments have traction in environmental management, investment is still required to promote the use of Social Impact Assessments.

Recommended Actions in this study with regards to the bolstering of the social dimension on MSP process includes broader communication with South Africans on ocean governance and the inclusion of affected communities in the development and implementation of marine spatial plans. Inclusion of social considerations into MSP will be difficult in South Africa, as Chapter Four demonstrated that social research in South Africa is among the least invested in and profiled by publicly funded research agencies. There is a growing series of publications that motivates for environmental governance to fully include the social dimension (Bennett et al., 2016; Whitney et al., 2017; Bennett et al., 2019). This will allow for the incorporation of community knowledge and aspirations, resulting in a more inclusive process. A more inclusive process will produce plans that have a higher likelihood of successful implementation owing to the broader sense of ownership. Bennett and colleagues promote the concept of a Code of Conduct for Marine Conservation towards ensuring that there are standards for incorporating social and community knowledge and rights into conservation planning (Bennett et al., 2017b; Bennett, 2018). A range of existing and potential social research disciplines are also emerging - ranging from political science and governance, to history, geography, marketing, law, economics and communication and community valuation systems for marine ecosystems (Bennett et al., 2017a; Bennett, 2019). In developing a coordinated programme of marine science in South Africa these social disciplines must be included to build support for government interventions. The 2017 *Biological Conservation* publication by Bennett et al., identifies the concept of Conservation Social Science that comprises classic, applied and interdisciplinary social science sectors and motivates that this applied field can meaningfully contribute to the achievement of conservation targets.

Incorporating the social dimension must by definition involve engaging with the affected people. In South Africa all policy processes must follow the Promotion of Administration of Justice Act (PAJA, 2000), which stipulates that citizens and affected parties must be consulted in the formulation of polices and even stipulates minimum advertisement periods for public comment. The study however is recommending something more proactive and meaningful than these minimum requirements and articulates more for the Code of Conduct and Conservation Social Science approaches described above.

Marine spatial planning, while being introduced as an objective, apolitical, rational and fair means to allocate space to different users, is now receiving some criticism for not meeting its objectives through failures in its implementation. This is largely owing to its failure to be fully participatory and inclusive (Flannery et al., 2016; Flannery et al., 2018; Tafon, 2018). There is also the suggestion of overt or covert uses of power that sees the normalisation, acceptance and implementation of agendas and objectives driven by governments or industry, market drivers and even foreign official development assistance and private philanthropic and non-government donors (Flannery et al., 2019; Wabnitz and Blasiak, 2019).

The extreme consideration of exclusion of stakeholders has seen the phrase Ocean Grabbing being coined to be analogous to Land Grabbing. Ocean Grabbing occurs when ocean space is reallocated away from historic, presumably valid users and uses without sufficient consultation and agreement. This results in detrimental consequences in the delivery and distribution of ocean ecosystem services to the traditional users (Bennett et al., 2015; Barbesgaard, 2018).

To avoid MSP being implemented in South Africa in a non-participatory, inequitable and ocean grabbing manner, the study places emphasis on its recommendations of stakeholder engagement and feedback into the ocean governance processes and agenda setting. The study also recommends improved communication, citizen science and fully shared management programmes where engagement begins in the drafting of the spatial plans and not only in the implementation phases. Figure 26 incorporates this idea of meaningful cooperative and shared management by including feedback arrows from the Critical Success Factors and the Recommended Actions to the Policy Formulation and the National and Global Contexts. There must be a process to incorporate lessons and iterate knowledge from stakeholder engagements into shaping governance contexts and policy. Government must ground truth its policy formulation and objectives so that it does not force an agenda through the control of power and capacity dynamics of the MSP processes. In doing this, there must be an awareness to create dialogue and engagement vehicles that allow for the equitable valuation, appreciation and inclusion of diverse knowledge sets.

South Africa through its Ocean Phakisa Programme is looking to add significantly to its economic development through accessing the oceans. Other African countries have also declared this intention. Blue economy objectives are reported from Somalia, Kenya, Madagascar and Nigeria (Axworthy, 2019). Namibia included in its 5th development plan a discussion on the Blue Economy (Namibian National Planning Commission, 2019); Mauritius has set up a Ministry of Blue Economy, Marine Resources, Fisheries and Shipping; and Djibouti, as early as 2016 published a marine spatial plan in the form of Seascape Management Plan for the Gulf of Tadjourah and Ghoubet-el-Kharab to zone economic and conservation activities (IUCN, 2016). The Ocean or Blue Economy has been established as an economic strategy for these African coastal countries. In South Africa this has been translated into political actions such as the creation of enabling policies and legislation.

Political will and mandates are generally reflected through these formal processes and in other informal processes where government has influence, including in the operational plans of organs of state (Link et al., 2019). Marine spatial planning has, in South Africa and other African countries, been identified as the operating procedure to achieve development of the ocean economy. Marine spatial planning was selected because it is motivated as a fair, transparent and equitable process through which to allocate ocean space to various sectors. This will be tested through the method and processes of implementation.

Ultimately the South African Government must set an agenda and deliver on it. In South Africa, the government agenda is currently overshadowed by the need to reinvigorate the economy. Ocean governance and marine spatial planning must then be implemented to meet this real pressure. The objectives of government in democracies does not need to have universal acceptance but must be the expressed desire of the majority of the population, or at least the majority of voting population. The "Lisbon Principles" remains attractive as a valid test for the acceptability of these objectives and the mechanisms through which they are attained. The Lisbon Principles are Responsibility; Scale Matching; Precaution; Adaptive Management; Full Cost Allocation and Participation (Costanza et al., 1998a).

Chapter Two, as the Methods Chapter of the study described a Phronetic Social Research Model approach to this investigation. The Phronetic Model is based on a set of key questions that must be answered during the course of study:

i. "Where are we going?
ii. Who gains and who loses, and which mechanisms of power?
iii. Is this development desirable?
iv. What, if anything should we do about it?"(Flyvbjerg, 2012, p. 3).

Answers to these questions can be made at several depths of resolution for Ocean Governance in South Africa. To conclude this study and in choosing to answer the questions at the highest level, the following concise responses are offered:

i. South Africa is progressing towards implementing an Ocean Governance Policy that has evolved through the Green paper, White Paper and Marine Spatial Planning Act.
ii. There are planned gains for the economy in identified ocean sectors and there will be a cost to the environment and losses for those currently associated with that environment. The power to decide this is centred within Government to set the agenda and drive the process.
iii. The development of an Ocean Governance Policy for South Africa is desirable because a country with access to such long coasts and large ocean spaces requires a national discourse and strategy on how to access, manage and mitigate the opportunities and risks provided.
iv. The mechanics of what we should do about ocean governance is answered in Figure 26 in terms of institutional arrangements, developing a more complete inter- and transdisciplinary science basis, information distribution

platforms and implementing an ecosystem-based approach to marine spatial planning through a dynamic, integrated, equitable, inclusive and transparent manner.

In reviewing the various global agendas and driving national pressures, I return to the Malawi Principles which were developed 22 years ago but still appear to be validated by the present case study of the Development and Implementation of Ocean Governance in South Africa. The Malawi Principles, as presented at the Fourth Meeting of the Conference of the Parties to the Convention on Biological Diversity (Bratislava, Slovakia, 4-15 May 1998, Document: UNEP/CBD/COP/4/Inf.9), are:

1) Management objectives are a matter of societal choice.
2) Management should be decentralized to the lowest appropriate level.
3) Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
4) Recognizing potential gains from management there is a need to understand the ecosystem in an economic context. Any ecosystem management program should:
    a. Reduce those market distortions that adversely affect biological diversity;
    b. Align incentives to promote sustainable use;
    c. Internalize costs and benefits in the given ecosystem to the extent feasible.
5) A key feature of the ecosystem approach includes conservation of ecosystem structure and functioning.
6) Ecosystems must be managed within their limits of their functioning.
7) The ecosystem approach should be undertaken at the appropriate scale.
8) Recognizing the varying temporal scales and lag effects which characterize ecosystem processes, objectives for ecosystem management should be set for the long term.
9) Management must recognize that change is inevitable.

10) The ecosystem approach should seek the appropriate balance between conservation and use of biological diversity.

11) The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.

12) The ecosystem approach should involve all relevant sectors of society and scientific disciplines. (Malawi Principles, 1998)

For South Africa successful Ocean Governance will be possible through the implementation of these principles while operating in and responding to the dire economic reality.

Post Script:

This analyses of the study was concluded at the end of 2019 with the thesis being submitted for examination in April of 2020. At the time of finalisation and submission the global reported infections and deaths as a result of the Corona virus / Covid-19 pandemic has just moved beyond 3 million and 200 000 respectively. The full extent of this on communities and the world economy is yet not clear. Thus far, dire consequences are being experienced in several countries through the impact of the disease and the government interventions of "lockdowns" that have slowed or stopped large portions of national economies. As the disease progresses to the developing and poorer parts of the world, devastating medical, economic and humanitarian emergencies are expected. This pandemic of 2020 will fundamentally impact on government priorities and reset governance contexts and management approaches. It will be necessary that People centred approaches must continue during and post this pandemic.

9. Appendices

List of Appendices

Appendix 1: **Table 17. The South African National Environmental Management of the Ocean White Paper's Reflection of International Trends.**

Note: Full wording of Strategic Themes, Strategic Priorities and Priority Statements can be found the NEMO White Paper (NEMO, 2014, pp. 11-18)
Key: X denotes inclusion or reflection of the concepts raised in the Strategic Theme and Priority Statement.

Strategic Themes	Strategic Priorities	Priority Statements	Objectives*			Priorities*				International Principles*				Additional Common Concepts**			
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Strategic Theme 1: Ocean Environmental Information				x		x									x	x	x
	Strategic Priority 1.1 Facilitate improved adherence with the ocean environmental reporting requirements contained in the National Environmental Management Act and associated domestic legislation.																
		Priority Statement 1.1.1 - Improved adherence to environmental legislation requiring the gathering and dissemination of environmental management information.				x											
		Priority Statement 1.1.2 - Sharing of information, and appropriate reporting structures and templates for data sharing developed.				x									x		
		Priority Statement 1.1.3 - High level indicators established for producing ocean environmental status reports.														x	
	Strategic Priority 1.2 Enhance research, monitoring and conservation of ocean ecosystems while supporting sustainable development opportunities.																
		Priority Statement 1.2.1 - Refine research, monitoring and mapping agenda for improved knowledge and understanding of ecosystems, pollution impact and resource potential.				x									x	x	
		Priority Statement 1.2.2 - Increase the number of science and engineering graduates in ocean-related studies,		x		x											x

		provision of opportunities to contribute to ocean knowledge, management and use. (Consider race & gender equity.)															
		Priority Statement 1.2.3 - Innovation and wide range of technologies to monitor the EEZ.				x											
Strategic Theme 2: Ocean Environmental Knowledge for Sustainable Development				x		x		x	x	x	x		x		x	x	x
	Strategic Priority 2.1 Produce knowledge products and information tools to facilitate knowledge and understanding of economic potential, the natural functioning of ecosystems, human impact on the ocean environment and the promotion of sustainable development opportunities.																
		Priority Statement 2.1.1 - Develop a South African Ocean Atlas, through creation of a SA Ocean and Coastal Information System; which describes natural systems, pollution impact, resource potential and utilization patterns.									x				x		
		Priority Statement 2.1.2 - Production of trends, scenarios and predictions for environmental information to be used in planning processes.				x			x				x				
	Strategic Priority 2.2: Establish agreed ocean ecosystem thresholds using the best available information.																
		Priority Statement 2.2.1 - Establish and refine a set of marine ecosystem thresholds for indicators towards proactive and adaptive planning				x										x	
	Strategic Priority 2.3: Provide knowledge to promote sustainable development while maintaining the integrity of the ocean.																
		Priority Statement 2.3.1- Publicly available spatial maps, inventories and knowledge tools to assist in identification of economic opportunities.						x	x						x		x
		Priority Statement 2.3.2 - Establish agreed spatial zone indicators and threshold limits towards reducing costs and						x	x	x							

		time of impact assessments and facilitate economic investment.															
		Priority Statement 2.3.3 - Technology innovation to support ocean science and industry across government and tertiary institutions.		x		x		x									
Strategic Theme 3: Ocean Environmental Management			x	x	x	x	x	x	x	x	x	x	x			x	
	Strategic Priority 3.1: Provide timeous information on trends and extremes in ecosystem and earth system functioning to improve responses to extreme weather events and inform adaptation measures.																
		Priority Statement 3.1.1 - Establish capacity for trend analysis, forecasting and prediction for marine environment in the context of SA's Climate Change Policy.					x										
		Priority Statement 3.1.2 - Enhanced long term monitoring to track changes in ecosystem functioning related to climate change or variability to improve knowledge for adaptation regarding livelihoods and extreme weather.	x							x							
		Priority Statement 3.1.3 - Better trend and scenario planning to improve preparedness for impacts of environmental changes or increased variability.					x										
	Strategic Priority 3.2: Promote the conservation, protection and rehabilitation of ocean ecosystems including habitat and species.																
		Priority Statement 3.2.1 - Facilitate conservation and improved availability of environmental information through use and cooperation with ocean-based industry sectors.	x			x											
		Priority Statement 3.2.2 - Department of Environmental Affairs will provide regulatory framework for as yet unregulated ocean uses (e.g. carbon sequestration and		x				x			x						

		storage; ocean fertilization, geo-engineering & deep see exploration).															
		Priority Statement 3.2.3 - Creation of network of marine protected areas (MPAs); prioritized conservation status for islands and support creation of network of MPAs outside national jurisdiction.	x		x					x							
		Priority Statement 3.2.4 - Rehabilitation of degraded habitats and projection of threatened species.	x				x			x							
		Priority Statement 3.2.5 - Adopt international agreed conservation targets and practices, where appropriate.			x							x					
		Priority Statement 3.2.6 - Support conservation efforts in High Seas, sub-Antarctic and Antarctic.	x		x					x		x					
	Strategic Priority 3.3: Establish biodiversity management plans for ecosystems and species.																
		Priority Statement 3.3.1 - Develop high-level norms and standards to guide environmental best practice in ocean sectors.	x						x	x			x			x	
		Priority Statement 3.3.2 - Development of marine spatial plans (facilitate new and existing economic opportunities and maximum protection to threatened species and habitats).	x						x	x			x				
		Priority Statement 3.3.3 - Effort in protection and conservation of heritage resources, ecological and biological significant areas and species.	x							x							
		Priority Statement 3.3.4 - Establish best practice guides for transport of harmful and noxious substances (e.g. hydrocarbons; persistent organic pollutants and industrial waste).											x			x	
		Priority Statement 3.3.5 - Encourage efficient approaches to marine discharge of waste (sewage) water treatment and monitoring.											x			x	
		Priority Statement 3.3.6 - Establish regulations to use alien species and minimize threat of invasive species.	x							x						x	

Strategic Theme 4: Ocean Environmental Integrity					x				x			x	x	x			
	Strategic Priority 4.1: Cooperate at a national, bi-lateral, regional and international level to advance sustainable ecosystem-based management of the EEZ, Continental Shelf, High Seas and Antarctica.																
		Priority Statement 4.1.1 - Move towards ecosystem bioregional management approach and eventual integrated ocean management.							x								
		Priority Statement 4.1.2 - Use of existing government Cluster approach to improve ocean governance cooperation, coordination to be led by Minister of Water & Environmental Affairs.							x					x			
		Priority Statement 4.1.3 - Participate in bi-lateral and regional Large Marine Ecosystem programmes, initially prioritizing Africa programmes and growing their collaboration.			x							x					
		Priority Statement 4.1.4 - Leadership in regional ocean governance, supported by SA research and management capacity.			x												
		Priority Statement 4.1.5 - Improved communication among national central authorities for the many marine related international agreements.			x							x	x				
		Priority Statement 4.1.6 - Promote equitable access to and benefit sharing of resources in the High Seas and Antarctica .			x							x					
		Priority Statement 4.1.7 - Promote global environmental protection in national interest, noting existing work in Southern Ocean and Antarctica.			x							x					

*Common Objectives, Priorities and Principles identified in the Green Paper; ** Additional common trends identified in this analysis in this study of other country Ocean Polices and Global Forums.

Key to Column Labels 1 to 15

Note: Full wording of the Objectives, Priorities and Principles can be found in the NEMO Green Paper in the reference pages.

a) Common **objectives** identified in the Green Paper (NEMO, 2012) from the study of 11 other countries national ocean policies (Ibid., 45).

1- Maintain and improve marine ecosystems, conserve biodiversity and restore degraded habitat
2- Improve the competitiveness and effectiveness of activities existing within their marine jurisdiction while at the same time researching and developing innovative and responsible future uses
3- Participate and strengthen their involvement in global and regional developments, which support efforts to combat climate change

b) Common **priorities** identified in the Green Paper (Ibid., 45-46) from the study of 11 other countries national ocean policies.

4- Support marine research and science
5- Protect the marine environment and tackle climate change
6- Extract optimum economic advantage from marine resources
7- Implement marine spatial planning and the ecosystem approach

c) Common **principles** as elements of sustainable development in international Law, as determined by global agreements that are intended for domestication by signatory countries identified in the Green Paper (Ibid., 14).

8- The principle of intergenerational equity which holds that natural resources must be preserved for the benefit of future generations

9- The principle of sustainable use which holds that natural resources should only be exploited (utilised) in a sustainable, prudent or rational or wise or appropriate manner

10- The principle of equitable use or intra-generational equity which holds that the exploitation of natural resources must be undertaken in an equitable manner so that exploiting states take into consideration the needs of other states

11- The integration principle, which holds that environmental considerations should be, integrated into economic and other development plans, programmes and projects as well as that development needs should be taken into consideration when environmental objectives are applied.

d) Additional common <u>**concepts**</u> identified in this analysis of the 11 national ocean policies selected by the Green Paper.

12- Institutional Arrangements for Marine Spatial Planning (MSP)

13- Data and knowledge shared platforms to support MSP

14- Addressing anthropogenic threats

15- Awareness, training and capacity building

Appendix 2: Description of Marine Science Key Performance Areas within National Departments and their Entities.

This appendix is summarised in Table 5 in the main text.

a) The Department of Environmental Affairs (DEA) funds oceans and coastal research through two of its programmes: the Antarctic and Islands research support programme which includes the semi-ice breaker research and supply ship the *SA Agulhas II – dedicated to Mariam Makeba* and a series of research projects that are undertaken within the Chief Directorate Ocean and Coast Research. These programmes are within the Branch Oceans and Coast of the DEA (DEA, 2018a). The total budgets for these two areas of work in 2018 was about R310 million annually. This comprised of R115 433 000 for the Chief Directorate Ocean and Coastal Research and R194 295 000 for the Antarctic and Islands Programmes (South African National Treasury, 2018b). The operating costs of the ocean environment *Research Vessel Algoa* is contained with the Chief Directorate Ocean & Coastal Research (about R52 million annually) and the operating budget of the research and supply the *SA Agulhas II – dedicated to Miriam Makeba* (about R122 million annually) is contained within the Antarctic and Islands Research Support programme. These science programmes and science support functions are carried within the Department, and are supported by some 110 staff, comprising researchers, engineers, technicians, and research assistants.

While the Oceans and Coasts Branch represents the largest concentration of investment in this area within the DEA, there are pockets of marine science that occurs in State Owned Entities that report to this Department. These pockets occur in the South African National Biodiversity Institute (SANBI), The South African National Parks (SANPARKS) and the South African Weather Services (SAWS). Only SANBI has a dedicated unit relating to ocean and coast science called the SANBI Marine Programme (SANBI, 2018). However, this unit has only three staff, and is also expected to derive much of its operational research funds through applications for research grants and does not undertake dedicated long-term monitoring or science projects. The South African Weather Services maintains 23 sea surface temperature stations (SAWS, 2018). Marine science related aspects in SANBI, SAWS and SANPARKS do not constitute major areas of investment within these organisations in both the structure and budget allocations of the organisations. None of these entities present their budget in the annual plans or websites at a resolution that allows investment in marine aspects to be calculated, also indicating that at present marine programmes are not significant areas of expenditure.

The science outputs areas of SANBI are listed as mapping and zoning of coastal and offshore habitats and supporting conservation policy. SANPARKS as the primary conservation authority of the DEA undertakes various monitoring and reporting efforts in coastal marine protected areas. The SAWS undertakes monitoring of sea surface temperature and forecasts ocean swell as an advisory service.

b) The Department of Agriculture Forestry and Fisheries (DAFF) is mandated with the fisheries management function among its other agriculture management and support roles (DAFF, 2018). This includes the assessment of fish stocks. DAFF in its Fisheries Branch houses a Chief Directorate Fisheries Research and Development which primarily undertakes stock assessment. The Chief Directorate operates two research ships, an almost 80-meter trawling fisheries survey vessel, the *Fisheries Survey Vessel Africana* and a 43-meter smaller vessel used for research on other species including line fish species and rock lobster, the *Fisheries Survey Vessel Ellen Khuzwayo*. The budget of the Chief Directorate Fisheries Research and Development for 2017/18 was R 69.8 million (South African National Treasury, 2018b).

c) The Department of Science and Technology (DST) of South Africa funds science across a variety of disciplines and has research agencies that report to it directly or indirectly. The Council for Scientific and Industrial Research (CSIR) and the South African National Space Agency (SANSA) are examples of entities that report directly to the Department. Other entities report indirectly to DST via the National Research Foundation (NRF).

Several areas of funding for ocean and coasts science and technology were identified in the entities of the DST (DST, 2018). These include projects in the CSIR, the SANSA, and within the NRF, the South African Institute of Aquatic Biodiversity (SAIAB) and the South African Earth Observation Network (SAEON). Determining levels of funding for marine aspects of work within these DST entities has proven difficult. Annual reports and information on the entities' websites do not contain budget resolutions that would provide funding details at the level of projects or teams associated specifically with marine related science and infrastructure only. These entities are not marine science focused solely and undertake a diverse number of research projects and disaggregation of their budget is therefore difficult with the information that is publicly available. Additionally, the operational mode of the entities within the DST is that a core funding grant called the Parliamentary Grant is allocated to the entity that will cover a percentage of their fixed costs such as office space, computing, travel and salaries. The entities are then expected to actively seek funding for research operations through competitive research funding calls, nationally and internationally.

The South African Institute of Aquatic Biodiversity (SAIAB) is an entity of the National Research Foundation (SAIAB, 2017, 2018) and undertakes science projects related to fish biodiversity in fresh water and salt water environments. There does not appear to be an investment in long term monitoring within SAIAB. The primary research focus is documenting biodiversity and understanding of processes in aquatic systems. SAIAB does manage and curate a National wet collection consisting of the National Fish Collection, the SAIAB African Amphibian Collection, the Aquatic Biodiversity Tissue Bank and the National Diatom Collection. Science is undertaken both within SAIAB by research staff employed by SAIAB and through the funding of research programmes, where researchers outside the of SAIAB can compete for funding. Outside researchers compete for funding through proposal applications for the use of SAIAB research platforms and facilities such small inshore boats, use of acoustic tracking equipment and access to dive support. SAIAB operates from a core Parliamentary Grant from the NRF, which for the 2017 financial year was R17 407 000, while the total revenue for the year with additional funding was R48 848 000 (NRF, 2017).

The South African Environmental Observation Network (SAEON) is established under the National research Foundation and serves to collect and archive environmental observation data with a focus in long term monitoring data sets (SAEON, 2014, 2018). Like SAIAB, SAEON is funded from the DST through the NRF and receives a core Parliamentary Grant which provides for essential corporate services and staffing and is then expected to generate funding for its work through applications for research grants. In 2017 the core Parliamentary Grant awarded to SAEON was R11 103 000 million, with the total budget for the year being R 58 798 000 (NRF, 2017). The work of SAEON is not dedicated only to ocean and coasts science but split among 6 operational nodes with two focused on marine issues: the Egagasini node focusing on offshore habitats and the Elwandle node focusing on coastal and on-shore habitats.

The NRF, outside its agencies like SAEON or SAIAB, directly funds the South African National Antarctic Programme (SANAP). This programme funds operational costs of research projects in the Southern Ocean, the Prince Edward Islands and in Antarctica, where South Africa operates overwintering bases (SANAP, 2018). This Programme also funds research projects on Gough Island, which is a UK territory, on which South Africa operates a year-round research base, primarily focusing on weather monitoring and is managed by the South African Weather Services. The NRF funded the SANAP programme in 2016/17 with R25.5 million (NRF, 2017). The SANAP projects covers a range of short term projects (1 to 3 years) to undertake to observations, surveys and generate science products on understanding natural process functions. The grants holders include a range of university departments, research organisations of the NRF and other government departments like DAFF and DEA.

The CSIR is the largest government science agency and was created in 1945 to advance and meet South Africa’s technology interests and needs. The CSIR is a complex organisation with several research units, that in some cases appear to have overlapping areas of work. The core Parliamentary Grant transfer from the Department of Science and Technology to the CSIR was R714 105 000 for the 2017 financial year, of the total CSIR budget of R2 755 665 (CSIR, 2017). The remainder the funds are derived from other research grants received from the DST, other organs of States, and national and international government and private clients. It has broad Operating Units that house several Competence Areas, which are comprised of Research Groups. In addition to these Operating Areas, the CSIR manages more focused units called Hosted Sector Initiatives. Aspects of ocean and coasts science occurs in various units in the CSIR[11]. Quantifying these in terms of total funding was not possible from the publicly available information, however key science performance areas are categorized from the various groupings based on publicly available documents.

The most directly marine associated group is the Coastal Systems Research Group of the Natural Resource and the Environment Competence Area. This Research Group is concerned with pollution impact, shoreline stability, ecosystem assessment and process studies for coastal habitats including estuaries. These expert studies are undertaken in support of decision making for development applications. Within the Natural Resources and Environment Competence Area a project on automated coastal observations through camera systems is also reported on, although it does not appear to fall within the Coastal Systems Research Group.

The Digital Environment Competency Area houses the CSIR Meraka Institute. This Institute focuses on acquiring several data streams, creating knowledge products and disseminating these to stakeholders. There is an emphasis on remotely sensed and satellite data, and this may be perceived as superficial overlap with the South African National Space Agency (SANSA). However, the Meraka Institute's focus on creating composite knowledge products from multiple data streams, development of smart and wireless technologies and computing, does appear to

[11] During this study the CSIR underwent a re-structuring in 2019, re-organizing many of its operational units.

separate it from the space technology development and communication focus of SANSA. This Institute has been undertaking the flagship project of the National Oceans and Coasts Information System (CSIR, 2017).

The National Oceans and Coasts Information System (OCIMS) is a data system that brings together data across multiple National marine sectors. The OCIMS then develops composite knowledge products such as ship tracking and presents this on a publicly accessible platform. This System is intended to support the sustainable development of South African ocean economy by providing basic information on sector use and maps for marine spatial planning processes. The OCIMS is a joint investment from the Department of Science and Technology and the Department of Environmental Affairs (OCIMS, 2018).

Notable Ocean and Coasts research infrastructure within the CSIR is the Coastal and Hydraulics Laboratory simulation facility which allows for physical construction of scale models of ports and two-dimensional and three-dimensional modelling of wave energy dynamics in and around ports. This applied research support port design and operations research including, optimising ship handling and loading. This facility is structured into the Built Environment Competence Area, and is directly supportive of growing the ocean economy around port and shipping development.

The Southern Ocean Climate Change Observation (SOCCO) group is difficult to place in the structures of the CSIR. It is not listed as a Research Group in any Competence Area and is not listed as an ongoing project on the various web pages of the Competence Areas of the CSIR, although it is detected as a project as a result of search within the CSIR domain for ‘ocean’. SOCCO has a dedicated internet domain (SOCCO, 2018). The unit’s key science output areas include Southern Ocean fine scale chemistry and oceanographic observations with particular strengths in ocean carbon exchange measurements and modelling. There are no budget figures reported on these web pages and there are several aspects of ocean science infrastructure that the unit has or lists as having access to, from chemical analytics to ocean glider robotics and sensors.

The Applied Centre for Climate and Earth System Science (ACCESS) is listed as a Hosted Sector Initiative and undertakes earth systems modelling (DST, 2018; Sweijd et al., 2015). While this Initiative undertakes a broad scope of work including terrestrial and atmosphere related projects, it also undertakes ocean and coastal projects. The budget reported in its annual report is not at a resolution where ocean and coasts projects funding can be calculated. Similar to the other units of the DST and NRF, ACCESS is allocated a core grant that primarily supports a few central staff, and is expected then to create partnerships and draft proposals to attract national and international research funding. The core funding for ACCESS in 2015, the last annual report publicly available was R11 793 097.

The South African National Space Agency (SANSA), like the CSIR is an entity that directly reports to the DST. SANSA maintains core skills in space science, engineering and technology for the operations and development of national applications for communication and observation (SANSA, 2018a). These capacities are maintained towards contributing to a range of product development such space weather observations, forecasting and environmental mapping for spatial planning. The annual budget of SANSA for 2016/17 was R262 763 259 and is primarily made of the core Parliamentary Grant from the Department of Science and Technology which amounts to R131 226 000 (SANSA, 2018b). The remainder is comprised of Research Grant transfers that have a limited life span and do not fund core activities and staff. SANSA activities are not primarily directed at ocean and coasts output. Publicly available information on core funding for support infrastructure cannot be resolved into allocations to ocean and coasts products. SANSA does not have a history of ocean observations and applications but this has changed over recent years, with investment in acquiring satellite data that covers ocean observations, including technology development in cube satellites to improve ship tracking in South Africa's EEZ..

d) The Department of Transport (DOT) manages the South African Maritime Safety Authority - SAMSA (DOT, 2018; SAMSA, 2018). This authority, while not undertaking any science or scientific processes does monitor shipping traffic in the ocean space around South Africa through voluntary ship reporting mechanisms and technologies. Voluntary and mandatory ship reporting is regulated by the International Maritime Organisation. The primary operation of SAMSA is to regulate the shipping industry according to national and international laws and standards. SAMSA also is the authority that co-ordinates search and rescue for the South African and adjacent ocean. SAMSA as a regulatory authority operated on a budget of almost R400 000 000 in 2017 (SAMSA, 2018), although investment in the ship tacking specifically cannot be calculated separately from information available.

e) The Department of Mineral Resources (DMR) supports the Council for Geosciences which, while working primarily on terrestrial mining resources, does have a small marine geosciences unit (DMR, 2018; CGS, 2018). The marine geosciences services offered include mapping, dive surveys and engineering site services and sediment dynamics. These services are available for hire, and no long term or systematic mapping of the ocean floor is reported.

The Petroleum Agency of South Africa presumably resides within the DMR, the reason for this ambiguity is that until 2010 the Departments of Mineral resources and Energy were situated in one Ministry. Since their separation, the placement of this agency has not been fully concluded. This agency coordinated the development of South Africa's extended continental shelf claim (Petroluem Agency SA, 2018). The Agency facilitates the provision of exploration and exploitation licences and geological survey data acquisition and dissemination. The Agency like the Council for Geoscience is expected is raise its own funds, outside a core grant from the DMR. The details of the budget of the shelf claim or the operating cost of the marine related work were not available from the agency's webpage. The Annual report is also not available at the time this search was done.

f) The South African National Defence Force houses the South African Navy that provides the South African National Hydrographic Office (SANHO). The SANHO is legally responsible for providing for the important science based product of navigation charts for the ocean around South Africa (SANHO, 2018).

g) The Department of Arts and Culture must be included in the review of science agencies as, although it does not undertake ongoing research activities, it does have oversight over the South African Heritage Resources Agency (SAHRA) and the National Museums. While the museums to various extents curate collections of marine specimens, the SAHRA is responsible for identifying and documenting ship wrecks and coastal heritage sites such as prehistoric human civilisation sites (DAC, 2018; SAHRA, 2018). These will be important additional datasets to environmental and resources datasets during the marine spatial planning processes.

h) The Universities in South Africa function quite independently, but do however reside

within the Department of Higher Education. There are 26 Universities in South Africa (DHET, 2018). Universities in South Africa are provided some support by this National Department towards their operations but are largely expected to pursue their own funding for applied research through grants offered nationally and internationally. Nationally, these grants in South Africa generally derive from various avenues afforded by the Department of Science and Technology. More capacitated universities can attract larger percentages of these competitive funds in national and international programmes. Ocean and coasts related work is difficult to identify as it can reside in various academic departments and at various levels within the university hierarchy. Among the 26 universities, the following universities have shown direct investment in ocean and coasts related work: Durban University of Technology, Cape Peninsula University of Technology, Nelson Mandela University, University of Cape Town, University of Kwazulu-Natal, University of Pretoria, the University of the Western Cape, the University of Stellenbosch, University of Zululand and Walter Sisulu University.

The Durban Institute of Technology (DUT, 2018) does not offer a dedicated natural science or engineering programme for ocean and coast fields, but does provide for vocational training in maritime fields relating to ships operations.

The Cape Peninsula University of Technology (CPUT, 2018) undertakes science and research development in the engineering technologies through the development of environmental monitoring in the form of coastal buoys. The development of coastal buoys is a programme implemented in partnership with and cofounded by the Department of Environmental Affairs. The University also receives a grant from the DST towards the development of microsatellite technology for marine domain awareness, primarily the monitoring of ship traffic. The CPUT is also unique among the South African universities in that it offers an undergraduate technical degree in Oceanography. CPUT, like DUT also provides vocational training in maritime studies towards aspects of ship operations.

The Nelson Mandela University has over the last decade invested in positioning itself as a university with a focus on oceans and coasts science fields (NMU, 2018). In 2017, this University, launched an Ocean Science Campus which provides a base for several ocean related disciplines. In addition to the buildings of the ocean campus the University has established the Institute for Coastal and Marine Research, with the objective of interdisciplinary research. The capacities in this unit has a history of performance in the natural science fields. This unit houses existing university expertise, and also DST funded programmes such the research chairs. Research Chairs can be funded by the DST or in some instances from University funds, and aims to attract leading researchers to build a body of work through collaborations and post-graduate students. Research Chairs are generally funded for 5-year periods, which may be renewed. The existing Research Chairs within this unit are Marine Spatial Planning; Food Security; Law of the Sea; and Shallow Water Ecosystems.

The African Centre for Coastal Palaeoscience, is a separate unit that also has a coastal focus and undertakes research on the geographic advantages that southern

Africa, especially the coastal area of the Eastern Cape, offered to cognitive development in human evolution. This is a unique offering among the coastal universities in South Africa.
On maritime development, this university has launched the South African International Maritime Institute (SAIMI) which aims to offer vocational training for the shipping industry.

The University of Cape Town (UCT, 2018) is unique in that it is the only university in South Africa that has a dedicated Department of Oceanography. The University also constitutes a virtual grouping of researchers within and outside the university in the Marine Research Institute (MARE) to foster joint and integrated proposals and projects. UCT houses a DST Science Chair for Marine Ecology and Fisheries, that focuses on ecosystem process studies. The Department of Oceanography hosts two international bilateral post graduate research units focusing on oceanography, a French and a Norwegian Programme called ICEMASA and the Nansen-Tutu Centre respectively. The University of Cape Town is distinct from other universities as it engages in the widest range of marine related studies and teaching programmes outside the natural sciences, including law, engineering, sociology and archaeology. The legal teaching and research are concentrated in the Institute of Marine and Environmental Law.

The University of Kwazulu-Natal (UKZN, 2018) presents a marine focused research and training unit. This unit is the Marine Research Initiative & Estuarine Research Programme, and includes under- and postgraduate research and training. The university research is concentrated on localised studies of coastal environments, including aspects of pollution impact.

The University of Pretoria hosts the Mammal Research Unit (UP, 2018). The unit undertakes postgraduate training and research in a variety of mammal species, with a particular focus on marine mammals such as seal, dolphins and whales. This University, in addition to coastal research projects on marine mammals, has over decades undertaken research projects in the Southern Ocean and Prince Edward Islands.

The University of the Western Cape like other universities undertakes focused, short term research projects relating to various aspects of ocean and coastal ecosystems, particularly in the natural science departments (UWC, 2018). In addition to focused research on coastal and some ocean habitats and species, this university has also invested in human and infrastructure capacity to undertake applied marine chemistry towards identifying compounds with pharmaceutical potential. This is a growing international field known as marine biodiscovery. Additionally and as a unique offering the University houses the Institute for Poverty Land and Agrarian Studies – PLAAS, which undertakes social research into land and natural resources management, including terrestrial and marine resources. PLAAS also hosts a DST Research Chair in Poverty, Land and Agrarian Studies (UWC-PLAAS, 2018).

The University of Stellenbosch did not appear, from a search of its web pages, to have any dedicated units focused on ocean and coast or maritime related issues. The university does however undertake marine related research through postgraduate and academic staff projects in areas of biology and ocean chemistry. The University also notes research output in governance and legal studies related to the African coast (SUN, 2018).

The University of Zululand is located close to South Africa's largest estuary system – Lake St. Lucia. This estuarine system forms the major part of South Africa's only coastal World Heritage Site. The University does not have a dedicated ocean or coastal research department (UNIZUL, 2018). There is some evidence that it did previously undertake studies of this system through a unit called the Coastal Research Unit of Zululand but a search of its current web pages does not have any recent activity for the Unit.

While the Walter Sisulu University does not have a dedicated department focused marine or maritime studies, however it recently launched the National Pollution Laboratory, which aims to be the centre for National coastal water quality monitoring (WSU, 2018). This is programme undertaken in collaboration with and funding from the National Department of Environmental Affairs.

The University of Fort Hare is located in the East Cape Province, the Mangosuthu University of Technology is located in the Kwazulu-Natal Province, the Sol Plaatje University is located in the Northern Cape. These are universities that are situated in coastal provinces, but do not appear to have directly linked programmes or research output in oceans and coastal science related disciplines that can be detected from a search of the websites. The remaining in inland universities do not appear to have dedicated marine programmes. Inland universities such as University of the Witwatersrand and University of South Africa do include in their list of academic profiles, staff with ocean or marine related qualifications , the search did not reveal dedicated marine programmes.

Appendix 3: Table 18. Activity of National Marine Science Units in Information & Knowledge Key Performance Areas of the White Paper on National Environmental Management of the Ocean (NEMO)

The NEMO knowledge and information requirements summarized in Table 2 (Chapter Two) are tabulated in Table 18 in the first column, with the remaining columns assessing if the various science units within government perform in these areas. A score of one (1) denotes that the required knowledge area is addressed.

Key Performance Areas of National Marine Science Agencies	DEA - Ocean & Coasts Research	DEA - SANPARKS	DEA - SANBI	DEA - SAWS	DST - NRF - SAIAB	DST - NRF - SAEON	DST - NRF - SANAP	DST - CSIR	DST - SANSA	DOT - SAMSA	DMR - CGS	SANDF - SANHO	DAC - SAHRA	DHET - Universities	National Representation of Activity in Information & Knowledge Key Performance Areas - Total
NEMO Information & Knowledge Key Performance Areas															
Environmental Status Report	1	1	1		1	1	1	1	1						8
Indicators of Marine Ecosystems	1	1	1											1	4
Thresholds for Pollution Impacts	1		1											1	3
Pollution Impact Assessment	1							1						1	3
Cultural & Heritage Site Maps													1	1	2
Climate Change Impacts	1		1	1	1	1		1						1	7
Ocean Threat Scenarios	1			1				1						1	4

Key Performance Areas of National Marine Science Agencies	DEA - Ocean & Coasts Research	DEA - SANPARKS	DEA - SANBI	DEA - SAWS	DST - NRF - SAIAB	DST - NRF - SAEON	DST - NRF - SANAP	DST - CSIR	DST - SANSA	DOT - SAMSA	DMR - CGS	SANDF - SANHO	DAC - SAHRA	DHET - Universities	National Representation of Activity in Information & Knowledge Key Performance Areas - Total
Ocean Opportunity Maps											1	1			2
Ocean Use Monitored & Assessed	1									1					2
Norms & Standards for Ocean Industries	1													1	2
Ocean Technology Development	1							1	1					1	4
Regulatory Frameworks for Ocean Industries	1														1
Species & Area Protection Plans	1	1	1											1	4
Marine Spatial Plans	1													1	2
Information and Knowledge Key Performance Area Representation per National Agency - Total	12	3	5	2	2	2	1	5	2	1	1	1	1	10	

Appendix 4: Table 19. Categorization of Key Informants

Informant No.	Category
1	National Government Official
2	National Government Official
3	National Government Official
4	National Government Official
5	National Government Official
6	National Government Official
7	National Government Official
8	National Government Official
9	National Government Official
10	Large Marine Ecosystem Programme Manager
11	Large Marine Ecosystem Programme Manager
12	Industry Sector Representative
13	Industry Sector Representative
14	Industry Sector Representative
15	Legal Policy Developer/Advisor
16	Legal Policy Developer/Advisor
17	BCC Country Representative
18	BCC Country Representative
19	BCC Country Representative
20	Senior Manager of Provincial Environmental Management Agency
21	Ocean related State-Owned Entity Project Manager

Appendix 5: Interview Consent Form

CONSENT FORM

RESEARCH TITLE: **Ocean Governance in South Africa: Policy and Implementation.**

I have read the information presented in the information letter about a study being conducted by **Ashley D. Naidoo** towards the PhD Programme at the Institute for Poverty, Land and Agrarian Studies (PLAAS) at the University of the Western Cape.
This study has been described to me in a language that I understand and I freely and voluntary agree to participate. My questions about the study have been answered.
I understand that my identity will not be disclosed and was informed that I may withdraw my consent at any time by advising the student researcher.
With full knowledge of all foregoing, I agree to participate in this study.

Participant Name: _______________
Participant ID Number: ______________________________
Participant Signature: ______________________________
Date: ________
Place: ___________
Student Researcher: __Ashley D. Naidoo__
Student Researcher Signature: ___________________________
Student Number: 3580212
Mobile Number: 0827847131
Email: anaidoo@environment.gov.za
I am accountable to my supervisor: Prof M. Hara
Institute for Poverty, Land and Agrarian Studies (PLAAS)
Tel: +27 21 959 3733
Fax: +27 21 959 3732
Email: mhara@plaas.org.za

Appendix 6: Interview Questionnaire

Research Interview Questionnaire – as submitted for project Registration
Research Topic: Ocean Policy Development and Implementation in South Africa
Researcher: A. Naidoo
(Student Number 3580212)
(University of the Western Cape)

Key Informant Questions (3 pages)

Each interview will begin with requesting the interviewee to sign the consent form and informing the interview that the interview will be recorded for later analyses. The interview should not exceed 60 minutes depending on the responses.

Note: The approach to the interview is an open-ended conservation. The interviewer will have a hierarchical checklist of issues, that responses can be measured against, either during the interview, or after the interview during the response analysis. Where required the interview may prompt the respondent along an issue direction with subsequent responses being noted as being offered after prompting. The sub-questions below the main question can be used as prompts to further the discussion?

1) Please your state your name, current organization and position in the organization?
2) Did you have any role in the development of NEMO? If yes, can you please describe the role that you played.
3) Are you playing a role in the implementation of NEMO? If yes, please describe your role.
4) In your opinion, what do you think are the key objectives or features of the NEMO policy?
    a) Does the NEMO policy add value to the already existing environmental policy & legislation? (whether 'yes' or 'no' - in what ways is it adding or not adding value?)
    b) Do you think that there are duplications in the principles and strategic objectives of NEMO with other legislation? if 'yes' – what are the

duplications? If ‘no’, how different are these from those in other related policies and legislations?

5) Arising from the NEMO White Paper the Draft Marine Spatial Planning Bill has been published for comment. Do you think MSP is required in South Africa? <u>(whether ‘yes’ or ‘no’ – why is MSP required or not required?)</u>

   a) If you think that MSP is required for SA, what do you think are the critical necessary requirements for the implementation of Marine Spatial Planning (MSP)?

   b) What is your opinion on the decision making authority for MSPs resting with a combination of Ministers?

   c) What is your opinion on what criteria or considerations must be used when the MSP decision makers will decide on selecting among competing interests in the ocean?

   d) Do you think the MSP process underestimates user-conflict in the SA ocean space?

   e) Marine spatial planning as described by NEMO will be heavily reliant on stakeholder engagement.

   f) How can the MSP process, in your opinion be improved to be more inclusive, and who must be targeted for inclusive in the MSP stakeholder engagement?

   g) Where in the development of MSPs must stakeholder engagement be brought?

      Do you think must be centralized or distributed across the National Sector Departments?

6) Do you have an opinion on the phased approach to the implementation of the Oceans Policy?
   a) Do you think that multiple marine spatial plans must be developed simultaneously (all at the same time or individually one after the other?
7) The NEMO is heavily reliant on information and knowledge to build ocean management and make decisions on spatial planning.
   a) Do you that there is sufficient knowledge on the full range of marine ecosystem goods and services or users?
   b) In your opinion are there critical areas of knowledge that are presently not available or limited?
   c) Is there a priority list of information needs for marine spatial planning that you feel is necessary?
8) The Marine Spatial Planning aspect of the NEMO policy has been extracted to form the MSP Bill; are there others areas in the NEMO that you feel require immediate attention?
9) The highest-level objective of the NEMO policy is Environmental Integrity. How do you see the relationship between promoting environmental integrity and the use of the ecosystem based approach to marine management?
   a) How critical are regional partnerships or interventions at the Large Marine Ecosystem level to the implementation of the ecosystem based approach to marine management?
   b) How do you envisage the alignment of the Integrated Coastal Management Act -Provincial Coastal Plans and the NEMO – Marine Spatial Plans will happen?

10) Do you have any further comments on the development or implementation of the South African Ocean Policy?

11) Additional comments or notes on the interview. (if needed consultation and decision making processes; consensus or vote; who is involved and how, including workers, labour and communities? and to what level to workers and the people?

Appendix 7: Table 20. Ocean Governance Engagements Observed

No.	Date	Location	Title
1	16-19 February 2015	Swakopmund – Namibia	Marine Spatial Planning Regional Project Planning meeting of the Benguela Current Commission MARISMA project
2	13-15 September 2016	Windhoek-Namibia	Marine Spatial Planning Meeting Annual Regional Meeting of the Benguela Current Commission MARISMA Project
3	15-16 November 2016	Cape Town – South Africa	National Marine Spatial Planning Committee
4	24-25 April 2017	Cape Town – South Africa	National Marine Spatial Planning Committee
5	8-9 May 2018	Cape Town – South Africa	National Marine Spatial Planning Committee
6	27-28 February 2019	Cape Town – South Africa	National Marine Spatial Planning Committee
7	25 JULY 2019	Cape Town – South Africa	National Marine Spatial Planning Committee
8	17-18 October 2019	Cape Town – South Africa	National Marine Spatial Planning Committee
9	10-11 September 2019	Cape Town – South Africa	National Integrated Coastal Management Meeting Stakeholder Consultation

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