



TOGETHER, SECURING THE DIVERSE BENEFITS OF OUR HEALTHY OCEANS. PICK N PAY, PROUD PARTNER OF THE WWF SUSTAINABLE FISHERIES PROGRAMME.



REPORT

ZA

2016



Oceans facts and futures:

Valuing South Africa's ocean economy

Design and layout: BrandFoundry.co.za

Editor: WWF-SA

Authors: John Duncan, Samantha Petersen, Jessica Greenstone, Stephanie Rainier, Mkhululi Silandela, Monica Betts, Chris Kastern, Robin Adams, Junaid Francis, Thelisa Mqoboka, Pavs Pillay

Ocean scenarios contributors: Jane Turpie (Anchor Environmental), Kevern Cochrane (Rhodes University), Peter Britz (Rhodes University), Serge Raemaekers (University of Cape Town), Johann Augustyn (South African Deep Sea Trawling Industry Association), Goodwell Dinga, Marlene Laros (Western Cape Government), Saul Roux (Centre for Environmental Rights)

WWF-SA communications: Pedzi Gozo and Sue Ras

Front cover photo: © Mark Chipps

Published in August 2016 by WWF-SA, Cape Town, South Africa. Any reproduction in full or in part must mention the title and credit WWF-SA as the copyright owner.

Report to be cited as WWF-SA 2016, Oceans facts and futures: Valuing South Africa's ocean economy. WWF-SA, Cape Town, South Africa.

© Text 2016 WWF-SA All rights reserved

Tuna illustrations (SAIAB): Elaine Heemstra. Source: A guide to the Coastal Fishes of Southern Africa (2004) by Phil and Elaine Heemstra. Published by NISC and SAIAB, Grahamstown.

Tuna illustration (WWF-SASSI): Susan Abrahams

WWF is one of the world's largest and most experienced independent conservation organisations, with over 6 million supporters and a global network active in more than 100 countries.

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

CONTENTS

FOREWORD	2
-----------------	----------

SOUTH AFRICA'S OCEAN ECONOMY SCORECARD	3
-----------------------------------------------	----------

THE CONTEXT	4
Ocean biodiversity	4
Oceans servicing society	7

THE OCEAN ECONOMY	11
Fishing	11
Aquaculture	21
Coastal development	23
Marine mining, oil & gas	25
Tourism	26
Indirect impacts of economic activity	28

2036 OCEAN SCENARIOS	30
-----------------------------	-----------

OCEAN FUTURES: A CALL TO ACTION	35
----------------------------------------	-----------

SCORECARD CRITERIA AND DATA SOURCES	37
--------------------------------------------	-----------

REFERENCES	38
-------------------	-----------

FOREWORD

Our world is changing fast. Industries established over many decades are being wiped out almost overnight with the creation of new mobile applications while smart devices are rewriting our understanding of what it means to be connected.

© DAMIEN SCHUMANN / WWF



Our planet is changing equally fast. With the top fifteen hottest years on record occurring over the last two decades, 2014 and 2015 being the hottest, it is clear that the ecosystems of the future will look very different to those that we know and rely upon today.

While climate change and its associated impacts of warming oceans, acidification and sea-level rise fundamentally threaten the planet's oceans as we know them, in South Africa our oceans face a further diversity of challenges spanning increasingly intertwined and complex socioecological systems. Illegal and historical overfishing has decimated many of the once abundant inshore fish stocks, the price of which is now being paid by our coastal communities who have lost not just their livelihoods but a way of life. Offshore, new threats such as bulk sediment mining of the seabed and the unchecked expansion of fossil fuel exploration pose significant and poorly understood risks to entire ecosystems and associated industries.

Oceans facts and futures attempts to provide a snapshot of the state of South Africa's oceans at this point in time, shedding light on both the socioeconomic value of the goods and services provided by the ocean and some of the key ecological indicators. The information in this report has been collated from diverse and reliable sources and is intended to catalyse collaboration and act as a marker against which we can measure our progress in years to come. The report does not attempt to provide a comprehensive assessment of every issue, but rather a broad view which highlights the areas of concern and showcases some of the best-practice solutions that WWF and others are implementing in an effort to create a future in which humans and nature live in harmony.

For the first time, this report also attempts to describe potential future ocean scenarios, highlighting some of the important signposts that may determine the trajectory of our oceans in years to come.

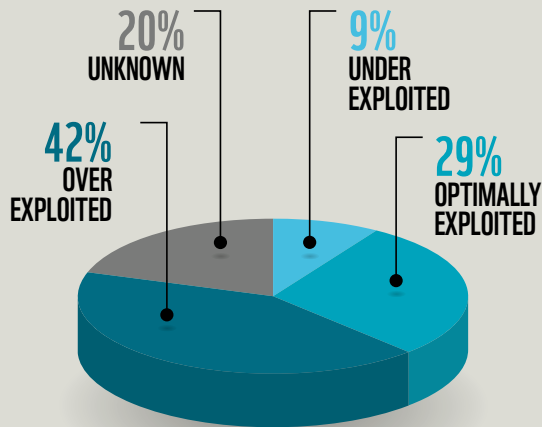
We have witnessed unprecedented change, both positive and negative, in our oceans during our relatively short tenure on this planet. We still have much to learn but one thing we have learnt is that knowing the facts alone will not create the change that is needed. If we are to build a resilient and prosperous future, we need to re-examine our relationship with nature. Conservation of marine ecosystems can no longer be seen to limit human survival and development, when in fact it underpins it. What the future looks like will very much depend on whether we are able to move away from this false dichotomy and acknowledge humankind's fundamental dependence on healthy ecological systems.

A handwritten signature in black ink that reads "John Duncan". The signature is stylized and written in a cursive-like font.

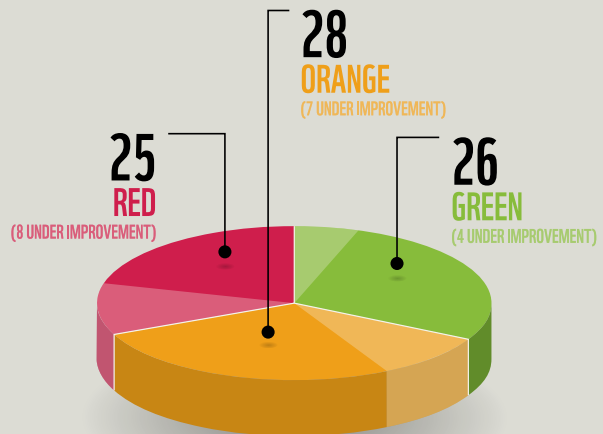
John Duncan
Senior Manager: Marine Programme, WWF South Africa

SOUTH AFRICA'S OCEAN ECONOMY SCORECARD

FISH STOCK STATUS



WWF-SASSI ASSESSMENTS

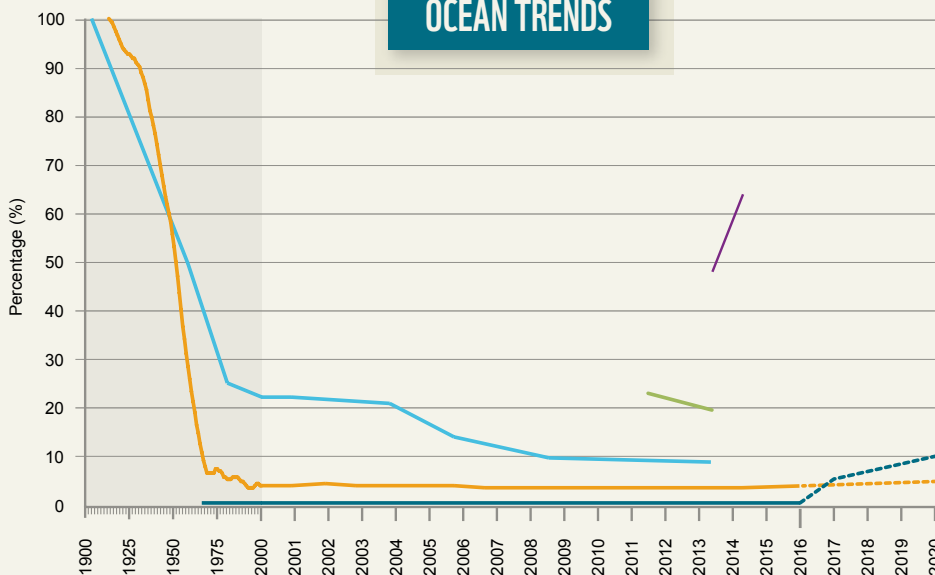


KEY CHALLENGES

ISSUE	STATUS
COASTAL LIVELIHOODS	
SUSTAINABLE SEAFOOD	
IMPLEMENTATION OF AN ECOSYSTEMS APPROACH TO FISHERIES	
MARINE SPATIAL PLANNING	
ILLEGAL, UNREPORTED & UNREGULATED FISHING	

See page 37 for scorecard criteria for each of these key challenges

OCEAN TRENDS



See page 37 for ocean trends data sources

KEY

- % WWF-SASSI Participants seafood products meeting commitments
- % of mainland EEZ formally protected in MPAs
- African penguin population size (relative to 1900)
- West Coast rock lobster stock (relative to 1910)
- % mislabelled seafood products on the SA market
- Future targets

THE CONTEXT

South Africa occupies the southern tip of Africa, its coastline stretching 2,798km from the western desert border with Namibia to the border with Mozambique in the east.

The coastline is remarkably smooth, with very few natural harbours. South Africa straddles three oceans, the Atlantic, the Indian and the Southern oceans, and includes an exceptional range of habitats from cool-water kelp forests to subtropical coral reefs. Just more than half of the coast is made up of sandy shores with the rest being mainly rocky.

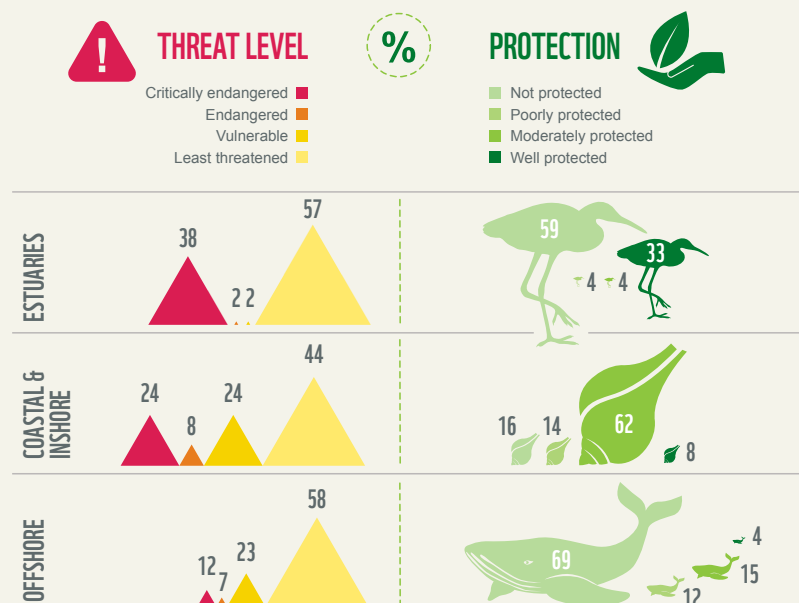
OCEAN BIODIVERSITY

12,914
RECORDED SPECIES IN
SOUTH AFRICAN WATERS

South Africa has a strong history of marine taxonomic research and maintains comprehensive and well-curated museum collections totalling more than 291,000 records. The marine biota currently recorded in South Africa number at least 12,914 species, representing 15% of the world's total, although many taxa, particularly those with small body sizes, remain poorly documented. These species are found across a number of diverse marine ecosystems including estuaries, wetlands, lagoons, salt marshes, mangroves and dunes. There are nearly 300 recognised estuaries along its coast (Van Niekerk et al. 2013), which act as nursery grounds for many juvenile fish and support large numbers of wading birds (Griffiths et al. 2015).

South Africa is also home to a number of important flagship species, and ten of the 22 species of albatross are found in South Africa's waters, including the wandering albatross which boasts the longest wingspan of any bird. Five of the seven marine turtle species (leatherbacks, loggerheads, green, hawksbill and Olive Ridley) and 37 species of cetaceans (whales and dolphins) are found in South African waters, including the largest of all known animals, the blue whale. A further 181 cartilaginous fish species (sharks, skates and rays), including the endangered great white shark, occur in South African waters.

FIGURE 1: OUR THREATENED ECOSYSTEMS



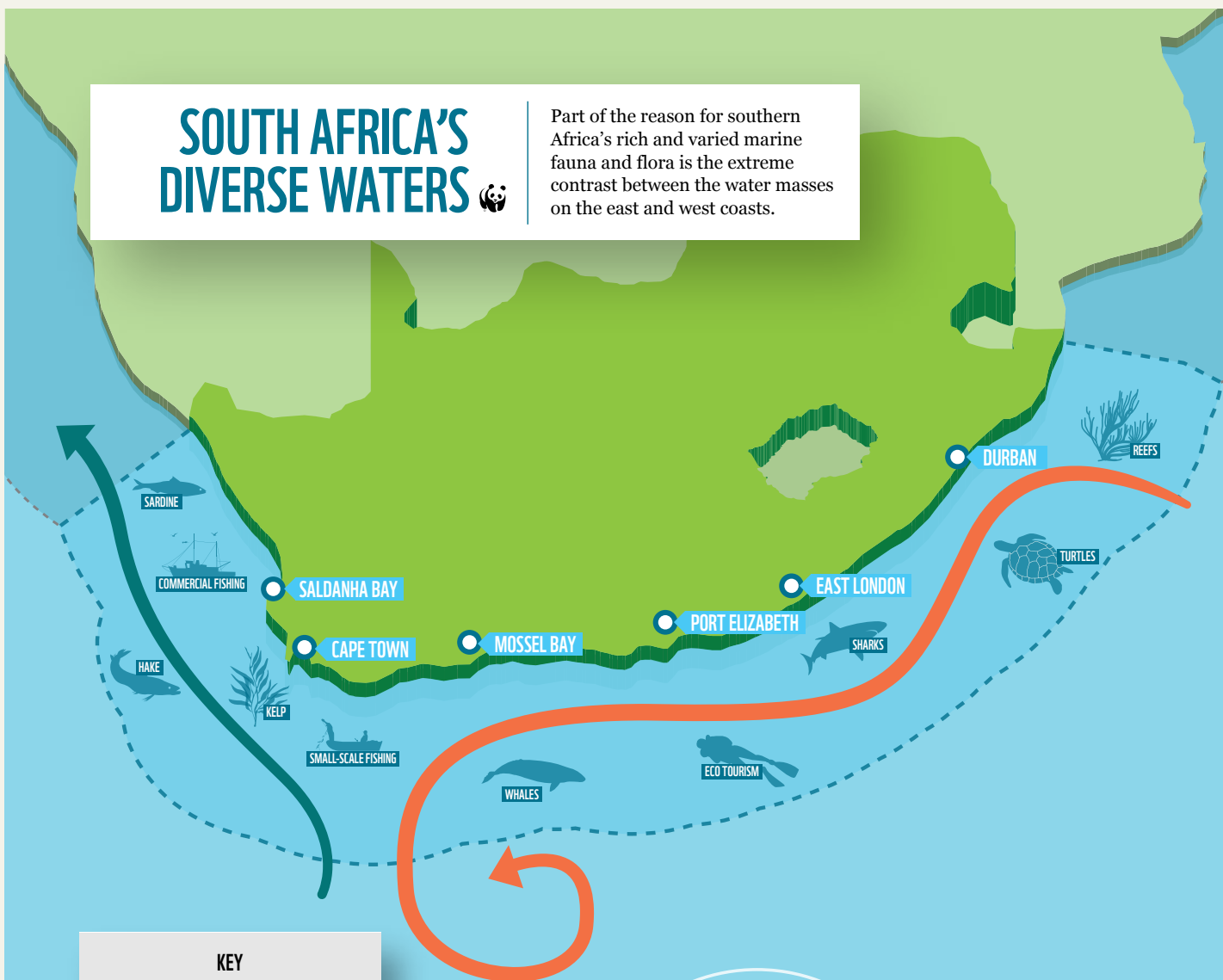
Source: SANBI National Biodiversity Assessment 2011

© WWF / BRANDFOUNDRY.CO.ZA

SOUTH AFRICA'S DIVERSE WATERS



Part of the reason for southern Africa's rich and varied marine fauna and flora is the extreme contrast between the water masses on the east and west coasts.



KEY

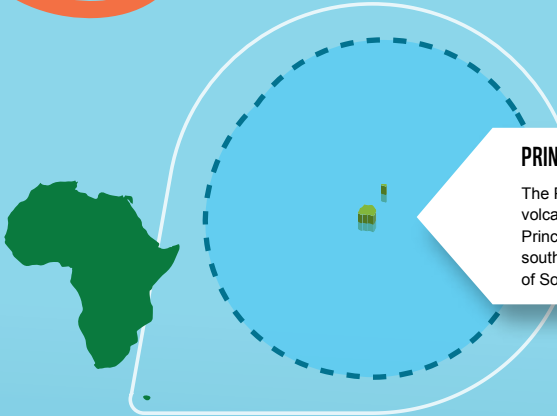
EXCLUSIVE ECONOMIC ZONE

The area stretching 200 nautical miles – 370.4 km – from the coast, where coastal nations have jurisdiction over natural resources. It is a concept adopted in 1982 at the 3rd United Nations Conference on the Law of the Sea. Waters in the South African EEZ extend to a depth of 5,700m, with more than 65% of this area deeper than 2,000m.

BENGUELA CURRENT

AGULHAS CURRENT

MAJOR COASTAL TOWNS



PRINCE EDWARD ISLANDS

The Prince Edward Islands are two small volcanic islands – Marion Island and Prince Edward Island – located in the south-western Indian Ocean that are part of South Africa.

COASTAL MARINE ZONE STATISTICS

	SOUTH AFRICA	WORLD
Length of coastline (km)	2,798	1,634,701
Continental shelf area (km ²)	160,000	24,285,000
Territorial waters (km ²)	74,000	18,816,000
Exclusive Economic Zone (km ²)	1,535,538 Mainland: 1,068,659 Prince Edward Islands: 466,879	101,900,000

Source: CIA World Fact book and Earth Trends 2016

UNEP has proposed a goal of conserving 10% of the world's coastline within MPAs by the year 2020

Marine protected areas

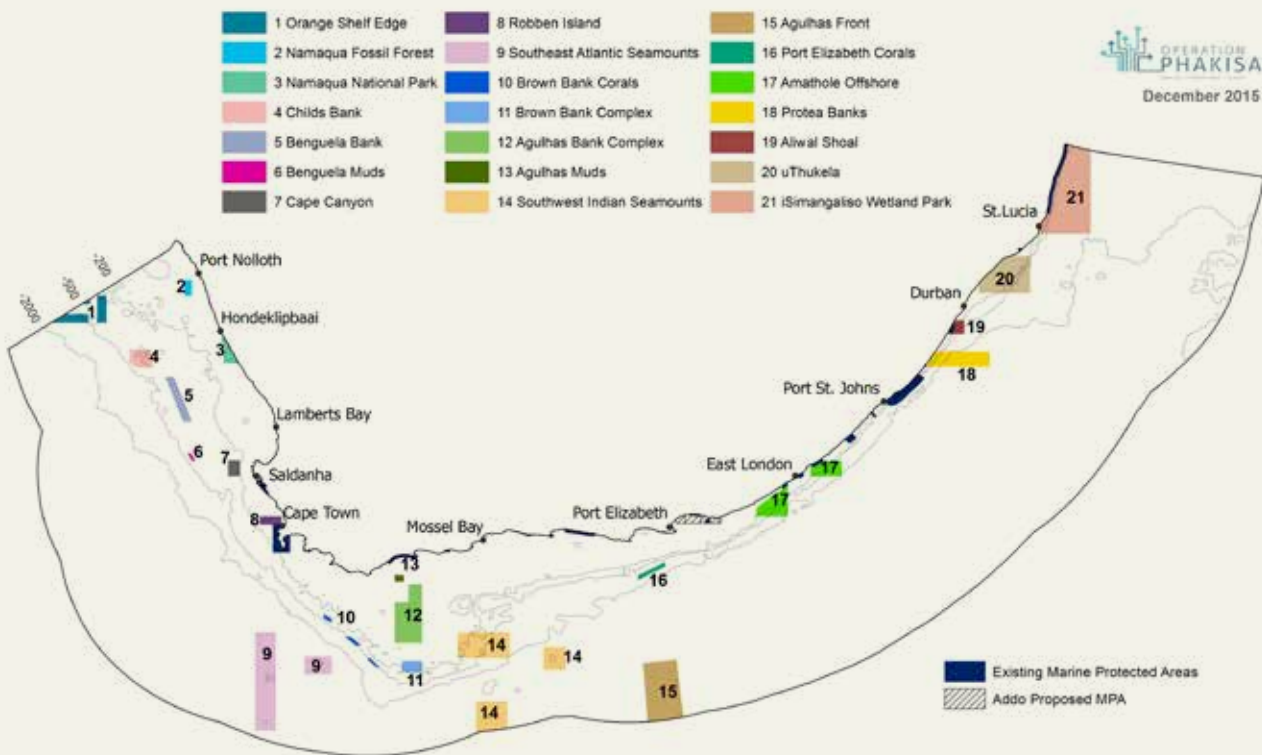
The ocean appears to be resilient to physical and chemical alteration because of its large volume, turbulence and high flushing rates, but there are marine ecosystems that have been severely impacted by anthropogenic activity. Marine Protected Areas (MPAs) play a vital role in maintaining biological diversity and ecosystem functioning by controlling activities in sensitive habitats and by preserving representative areas from development (Attwood et al. 1997). Importantly, MPAs should not be seen only as a means of preserving natural systems, but also for meeting a wide range of human needs, including education, recreation, research and generation of wealth (Kenchington 1990; Kelleher & Kenchington 1992).

The United Nations Environment Programme (UNEP) has proposed a goal of conserving 10% of the world's coastline within MPAs by the year 2020 (UN 1992). South Africa has ratified the Convention on Biological Diversity (Rio de Janeiro, 1992) and is thus bound by it.

<0.5%
OF SOUTH AFRICA'S MAINLAND EEZ IS FORMALLY PROTECTED

At present, while 23,2% of the length of our coastline is protected through MPAs (9% of which are “no-take”), less than 0.5% of South Africa’s mainland ocean ecosystems are formally protected by area, compared to approximately 8% of terrestrial areas. In 2016, the Minister of Environmental Affairs published a draft notice to propose a network of 22 new MPAs with the aim of creating approximately 70,000km² of additional MPAs, if proclaimed this will bring ocean protection within the South African EEZ to approximately 5%.

FIGURE 2: OPERATION PHAKISA PROPOSED MARINE PROTECTED AREAS NETWORK



Source: Operation Phakisa website

OCEANS SERVICING SOCIETY

Within 50 to 100 years of European colonisation, the marine hunter-gatherer lifestyle along the south and west coasts had practically disappeared

People and the coast

Archaeological evidence points to southern Africa as a place where humans first began to exploit the oceans for food. The coast has long been a place of dwelling, enjoyment and survival for people as far back as two million years ago, as is evidenced by the discovery of tools and middens along the west coast. It is likely that these coastal-dwellers would have been the first indigenous people that the Dutch settlers who colonised the Cape in 1652 encountered. Approximately 1,500 years ago, the east coast was also populated by a southward migration of tribes from north of the Limpopo River.

Within 50 to 100 years of European colonisation, the marine hunter-gatherer lifestyle along the south and west coasts had practically disappeared. Today much of the fishing activities along this coast are of a commercial nature. However, colonialism did not put an end to the marine hunter-gatherer lifestyle along the east coast where it persists in a modified form today. The coastal Xhosa, Zulu, Tembe-Thonga and various Mozambican tribes still harvest intertidal and other marine resources in much the same way as the prehistoric inhabitants of the continent did.

The settlement of people from Europe and Asia increased during the 19th century and gave rise to coastal cities, such as Durban, East London, Port Elizabeth and Cape Town. During the middle and late 20th century, apartheid policy explicitly denied access to marine resources to certain demographic groups of people. The transition to a democratic government in 1994 paved the way for all South Africans to enjoy equal rights of access to the coast and its resources.

LIFE-GIVING OCEANS

- The ocean, covering 70% of the Earth's surface, is a critical life support to humanity;
- About 50% to 70% of our oxygen comes from the ocean. That's more than is provided by all of the world's rainforests combined;
- The ocean regulates our climate and absorbs approximately one-third of the CO₂ produced;
- The ocean provides a critical source of protein for more than a billion people;
- The ocean holds 97% of Earth's water;
- More than 60% of the world's population lives on or near the coast; and
- The ocean provides livelihoods, a place of recreation, beauty, wonder and untapped scientific discovery leading to improved human health, new medications, foods and advanced technologies.

Climate and weather

The oceans play a critical role in regulating the planet's climate and weather patterns through the cycling of critical greenhouse gases such as CO₂. Global warming is likely to have dramatic effects, such as accelerating sea-level rise, ocean acidification, droughts, floods, storms and heat waves. These will impact everyone, including the world's poorest and most vulnerable people, disrupting food production, and threatening important species, habitats and ecosystems.

30%
OF CO₂ RELEASED FROM
HUMAN ACTIVITY DISSOLVES
INTO THE OCEANS

The South African coastline is expected to experience more intense and more frequent extreme weather events

At present an estimated 30% of the CO₂ released into the atmosphere from human activity dissolves into the oceans (Feely et al. 2004). About 20-25 million tonnes of CO₂ are being added to the oceans each day (UNESCO 2004), disrupting the balance of the global carbon cycle. This CO₂ absorption is increasing the acidity of ocean waters and threatening the survival of many marine species by disrupting marine food chains and altering ocean biogeochemistry. This is happening at the same time as other threats reduce the resilience of marine ecosystems so they become more vulnerable to the effects of global climate change.

Local predictions indicate that South Africa's coastal regions are likely to warm by 1–2°C by 2050, whereas the interior regions are likely to warm by 3–4°C during the same time period (Hermes 2011). Large-scale temporal shifts in sea surface temperatures or circulatory patterns have the potential to impact the structure and functioning of intertidal marine communities. Since the 1980s the sea surface temperatures of the Agulhas Current have increased (up to 0.7°C per decade) in response to changing wind patterns in the South Indian Ocean (Rouault et al. 2009).

There is also evidence that the sea level is rising around the South African coast (Mather et al. 2009), following global trends, but revealing regional differences. The sea level is rising by 1.9mm per year on the west coast, 1.5mm per year on the south coast and 2.7mm per year on the east coast. These values are different because of regional differences in vertical crust movements and large-scale oceanographic processes off the east and west coasts. With the rise in sea level and a possible increase in the frequency and intensity of sea storms, the South African coastline is expected to experience more intense and more frequent extreme weather events; increased saltwater intrusion and raised groundwater tables; greater tidal influence; increased flooding, with greater extent and frequency; and increased coastal erosion (Hughes et al. 1991).

THE EFFECTS OF CLIMATE CHANGE IN SOUTH AFRICA

The following changes have been observed in South Africa (Scholes et al. 2015):

- Changes in sea temperature;
- Shifting distributions of rock lobster and small pelagic fish have led to social, ecological and economic impacts that complicate resource management;
- Increased frequency and extent of coral bleaching;
- Rising sea levels;
- Increased coastal erosion linked to increased frequency and severity of storms; and
- Growing vulnerability of the 17% of South Africa's coastline with development within 100m of the shoreline.

Food security and livelihoods

The oceans are a key source of protein both locally and globally. Seafood now accounts for almost 17% of the global population's intake of protein (FAO 2014), and the global per capita seafood consumption has doubled since 1960. In South Africa approximately 312,000 tonnes of seafood is eaten annually, with per capita seafood consumption at 6.25kg in 2010 (WWF-SA 2014). However, some coastal communities who harvest marine resources, such as subsistence mussel harvesters in KwaZulu-Natal, are far more dependent on this resource for their protein needs.

Although not as economically important as agriculture, fisheries contribute 0.5% of South Africa's gross domestic product (GDP) and also play an important role in meeting food security needs and providing livelihoods for more than 100,000 people (CLA Report 2010). At present, a number of South Africa's marine resources are overexploited, which results in a loss of potential food protein, livelihoods and income, as well as the loss of the traditional fishing culture associated with South Africa's coastal communities.

Ecosystems services

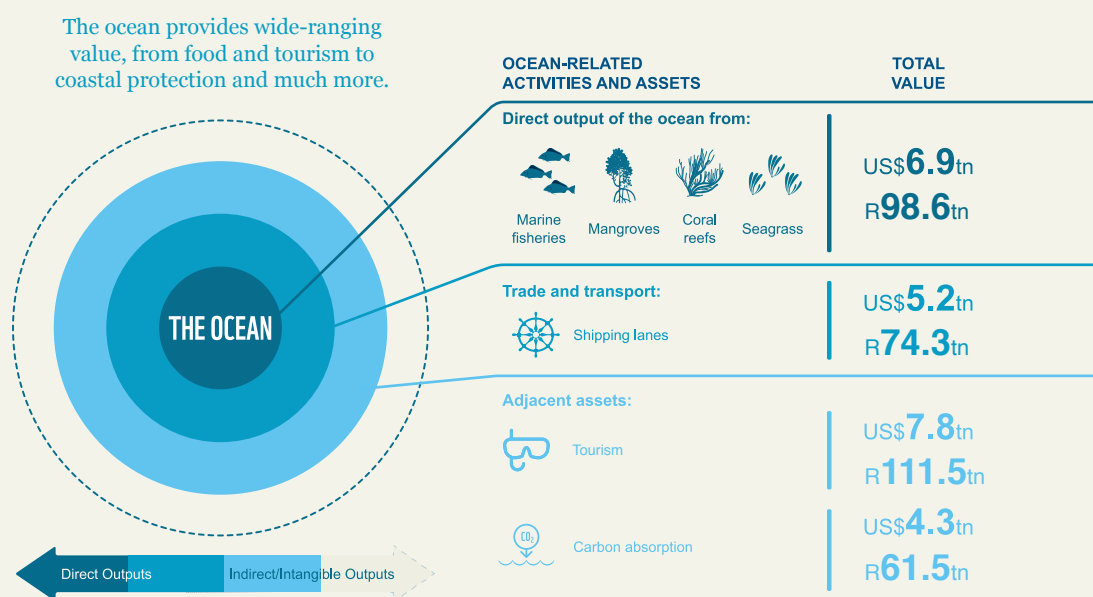
The coastal zone performs a multitude of ecosystem services: helping to attenuate floods; giving protection from storm surges; assisting with waste assimilation; offering habitats for a diverse array of organisms; and providing amenity services, such as tourism and recreation.

Although it covers just 8% of the world's surface, the coastal zone makes vital contributions to human well-being and ecological functioning (Agardy et al. 2005a). These activities provide significant opportunities for economic and income growth, reflected in the fact that more than two billion people live within 100km of a coastline (Agardy et al. 2005a). It is estimated that 30% of South Africa's population live within 60km of the coast (DEA 2000).

100,000
PEOPLE IN SOUTH AFRICA
RELY ON FISHERIES FOR THEIR
LIVELIHOODS

2 BILLION
PEOPLE LIVE WITHIN
100KM OF THE COAST

FIGURE 3: GLOBAL OCEAN ASSET VALUE



Source: WWF: Reviving the Ocean Economy Report



THE OCEAN ECONOMY

The South African coast and marine environment hold great economic value.

South Africa's rich and productive coastal waters support thousands of jobs and contribute millions of rand to the national economy each year, with coastal goods and services estimated to contribute 35% to South Africa's gross domestic product (GDP).

Globally, the oceans have been estimated to contribute a total of US\$24.2 trillion (R327.6 trillion) per year to human welfare (Hoegh-Guldberg et al. 2015), and provide 60% of the total economic value of the biosphere (Costanza et al. 1997).

FISHING: GLOBAL TRENDS

Seafood is a comparatively cheap form of protein and in some cases it's more affordable than protein from terrestrial sources (FAO 2016). With the human population expected to grow by two billion in coming decades, wild sources of seafood are in increasing demand (FAO 2014). Currently, fishing accounts for nearly 17% of the world's animal protein intake, and fish consumption is on the rise: per capita consumption increased from around 10kg in the 1960s to 19.7kg in 2012; and preliminary estimates for 2015 indicate that this is now above 20kg (FAO 2016). The ocean's capacity to keep up with this demand is dependent upon natural limiting factors, such as fish growth, reproductive success and environmental conditions.

GLOBAL FISH STOCKS IN 2013

31.4%
OVERFISHED
58.1%
FULLY FISHED
10.5%
UNDERFISHED

Source: FAO State of World Fisheries and Aquaculture (2016)

According to the FAO, global wild-capture marine catches reached a peak of 86.4 million tonnes in 1996 and have since declined (FAO 2014). In 2014, global wild-capture marine catches were reported as 81.5 million tonnes (FAO 2016). A recent collaborative project, the Sea Around Us, asserts that global fish catches between 1950 and 2010 were likely to be 50% higher than these reported statistics (Pauly & Zeller 2016), due to unreported catches from small-scale and recreational fishing sectors, unreported discards and illegal catches (collectively "illegal, unregulated or unreported" – known as IUU – catches). Estimates are that IUU costs global fisheries up to US\$23.5 billion dollars per year (Agnew et al. 2009).

Wild-capture commercial fisheries are estimated to have contributed at least US\$274 billion to the global GDP in 2007, with approximately 120 million workers directly dependent on these fisheries for their livelihoods (World Bank 2012).

FISHING: LOCAL TRENDS

South Africa's commercial fisheries consist of 22 sectors with more than 2,900 rights holders and approximately 1,788 vessels (DAFF 2012). Annual production was reported in 2012 as more than 600,000 tonnes with a value of R5.8 billion (DAFF 2012). A handful of high-value fishing sectors contribute disproportionately to these figures (see Table 1).

FIGURE 4: THE STOCK STATUS OF KEY SOUTH AFRICAN MARINE RESOURCES

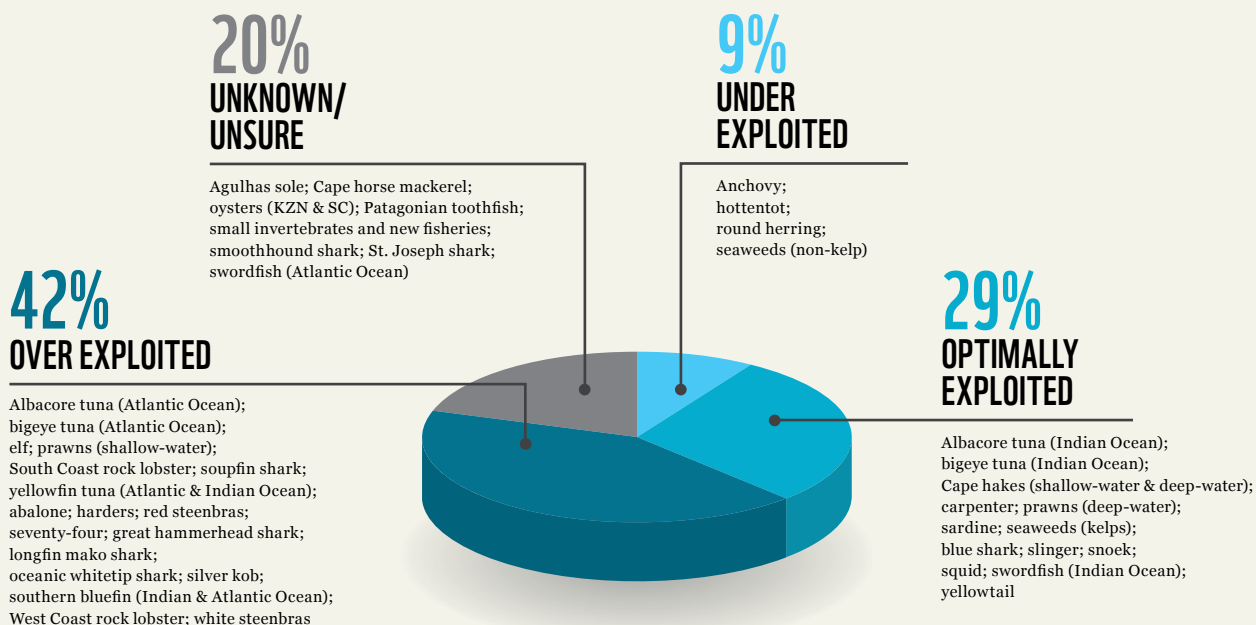


TABLE 1: SOUTH AFRICA'S MOST ECONOMICALLY VALUABLE WILD-CAPTURE FISHERIES

SECTOR	PRODUCTION (TONNES)	ESTIMATED VALUE AFTER PROCESSING (R)	DIRECT EMPLOYMENT
Abalone	2,496	1,083 million	~2,500 (including illegal)
legal	96	41.6 million	-
illegal	~2,400	1,092 million	-
Hake trawl	127,974	2,871 million	8,300
Small pelagics	200,000	1,550 million	4,360
Squid	8,000 (average)	400 million	2,998
West Coast rock lobster	>2,450	530 million	4,100 (as of 2003)
legal	1,801	530 million	-
illegal	~650+	-	-

Note: Reported information is for the most recent year in which information on production, value and employment were available (predominantly 2012 and 2013).

Illegal fishing is a significant threat for high value marine resources

Inshore resources

South Africa’s inshore marine resources are accessible to all three major user groups: commercial fishers, recreational fishers and the small-scale sector. The relative ease of access by all user groups, breadth of access points and large numbers of rights holders/users pose substantial challenges to effective governance and result in high fishing effort in inshore regions.

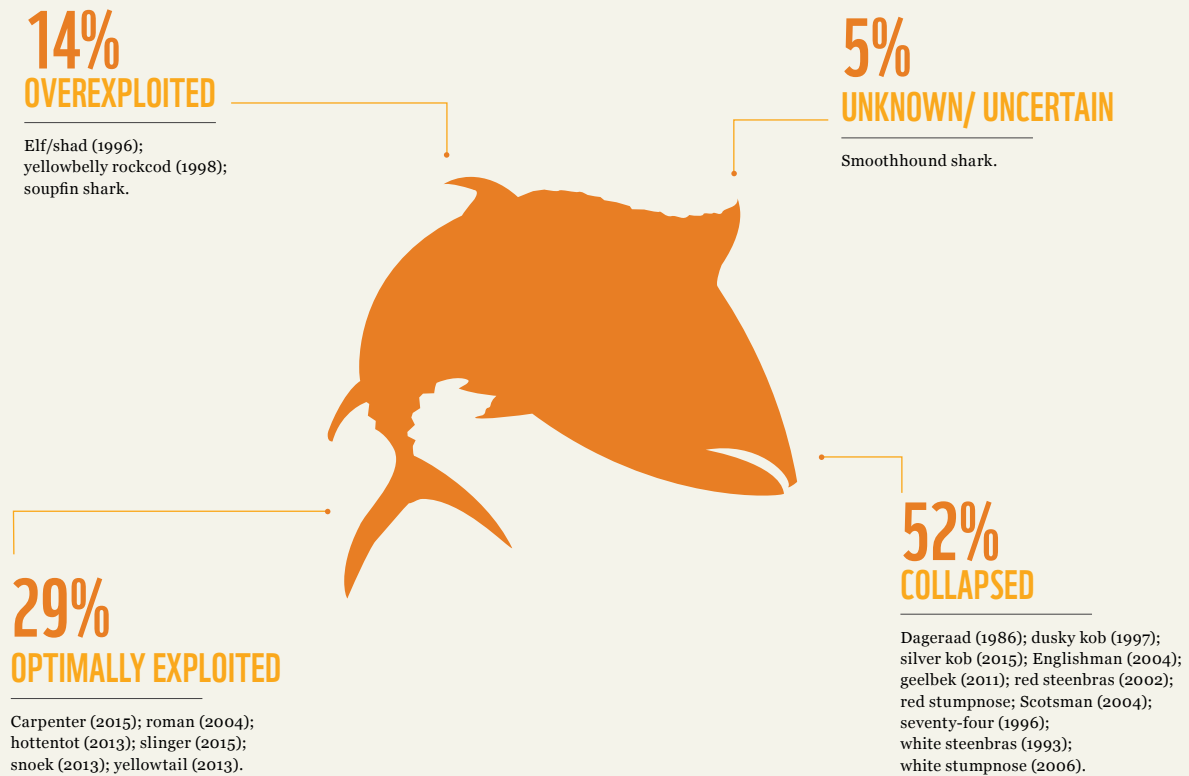
Abalone and West Coast rock lobster fisheries, which are particularly high-value commodities, present the most severe challenges. The existing governance framework cannot balance the powerful social, political and economic drivers fuelling high levels of illegal fishing, and, consequently, the biomass for both species is at or near commercial extinction.

South Africa boasts more than 200 “linefish” species that are commonly caught by handline and rod and reel off its coasts (Figure 5). These species are diverse and span a range from highly resilient to highly vulnerable to fishing pressure, with stock biomasses that similarly span from fully fished to severely overexploited. In response to substantial declines in many linefish stocks by the end of the 20th century (Griffiths 2000), a state of emergency was declared in 2000 (Attwood 2013). Subsequently, fishing effort has been reduced. This reduction in effort has started to bear fruit with recoveries of important stocks, such as carpenter and slinger. However, important stocks, such as red steenbras, silver kob and geelbek, remain in dire condition.

200

LINEFISH SPECIES ARE COMMONLY CAUGHT BY HANDLINE AND ROD AND REEL OFF SOUTH AFRICA'S COAST

FIGURE 5: STATUS AND STATISTICS PERTAINING TO 21 COMMERCIALY IMPORTANT LINEFISH SPECIES

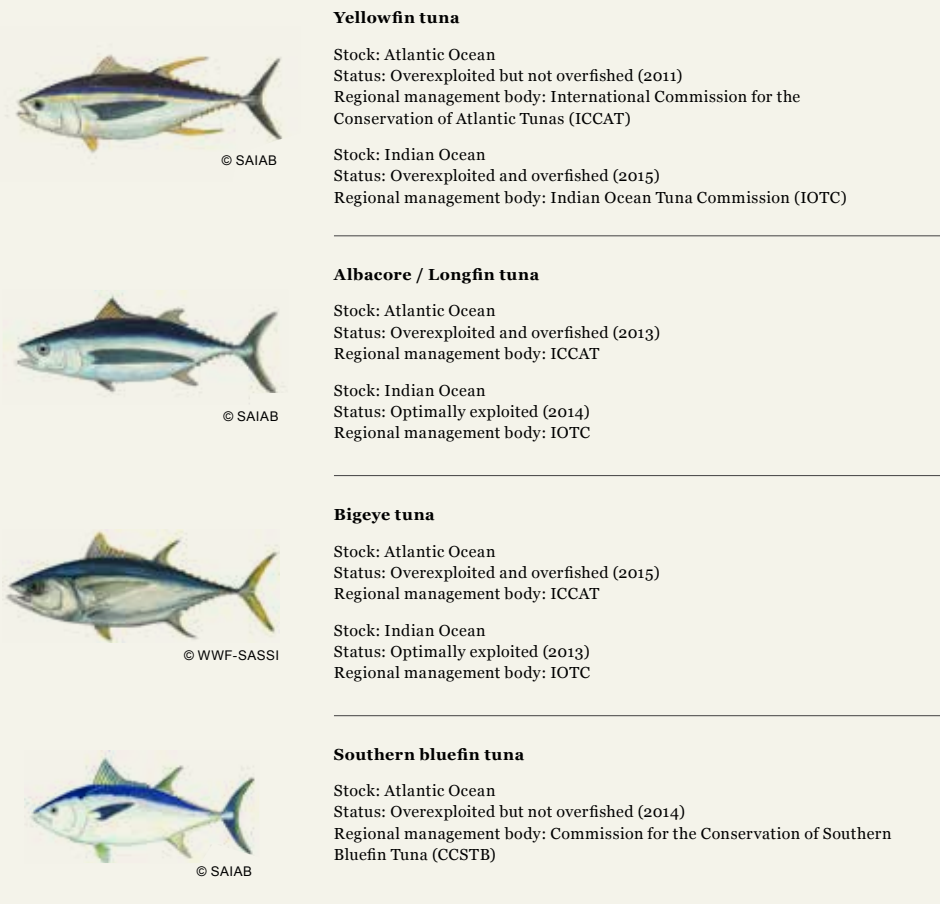


Note: The status of the above species is sourced from the date of the most recent assessment illustrated in brackets.

Offshore resources

It's generally perceived that offshore resources are more stable than inshore resources with less complexity surrounding their management. The smaller number of rights holders, relative difficulty of access, requiring large capital investments, and improvements to scientific data capture and monitoring, result in largely effective governance of offshore stocks. There are exceptions, however, the most notable being the status of stocks of commercially valuable large pelagic fish (e.g. tuna and swordfish) that are subjected to high fishing effort and weak governance outside of South Africa's EEZ. The substantial industrialisation of offshore fisheries, however, comes at the cost of often large environmental impact that must be appropriately understood, monitored and managed.

FIGURE 6: TUNA CAUGHT IN SOUTH AFRICAN WATERS



TAC: Total allowable catch (TAC), usually expressed in tonnes or number of fish, is a catch limit set for a particular fishery, generally for a year or a fishing season.

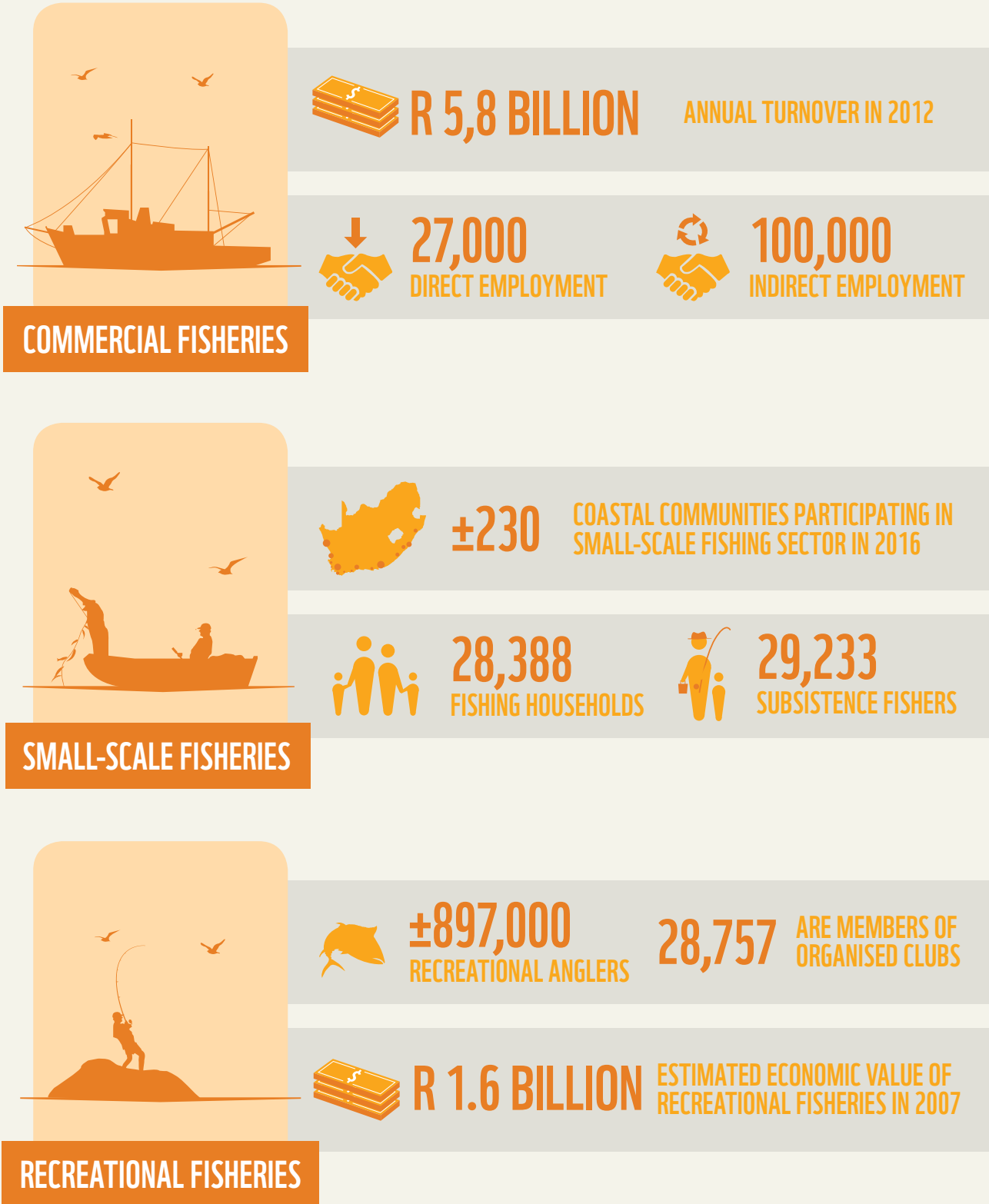
TAE: Total allowable effort (TAE) is a limit set for fishing capacity in a particular fishery, generally expressed as number of vessels, fishers or days at sea.

TABLE 2: SOUTH AFRICA'S COMMERCIAL FISHERIES

COMMERCIAL FISHERIES	INSHORE / OFFSHORE	NUMBER OF COMMERCIAL RIGHTS HOLDERS (AS OF 2015)	REGULATED WITH TOTAL ALLOWABLE CATCH (TAC) OR TOTAL ALLOWABLE EFFORT (TAE)	REPORTED LANDINGS OF TARGET SPECIES (TONNES) AND ESTIMATES OF ILLEGAL CATCH (WHERE KNOWN)	CURRENT WWF-SASSI STATUS AND NUMBER OF SPECIES ASSESSMENTS
Abalone	Inshore	298	TAC	96 (Illegal: 2,400)	1
Demersal shark	Inshore	3	TAE	17	2
Gillnet and beach seine fisheries	Inshore	120	TAE	634	1
Hake handline	Inshore	86	TAC	1,390	N/A
Hake and Agulhas sole inshore trawl	Inshore	16	TAC & TAE	Hake: 2,965 Sole: 209	 10 3
Hake longline	Both	137	TAC	9,207	3
Hake offshore trawl	Offshore	45	TAC & TAE	125,009	Both hake species:  2 5 4
Horse mackerel midwater trawl	Both	14	TAC	6,317	1
Oysters (South Coast & KZN)	Inshore	SC: 71 KZN: 23	TAE	SC: 327,120 oysters KZN: 52,620 oysters	SC: 1 KZN: 1
Patagonian toothfish	Offshore	6	TAC	276	Not assessed
Prawn trawl	Both	5	TAE	Prawn: 161 Other species: 193	Not assessed
Seaweed	Inshore	14	TAE except fresh kelp (TAC)	7,905	Not assessed
Small pelagics (sardine, anchovy & round herring)	Offshore	106	TAC	Sardine: 83,470 Anchovy: 237,630 Round herring: 13,414	2
South Coast rock lobster	Offshore	15	TAE & TAC	274 (tail mass)	Not assessed
Squid	Inshore	103	TAE	3,494	1
Linefishery	Inshore	455	TAE	6,445	9 10 8
Tuna and swordfish pelagic longline	Offshore	31	TAC & TAE	Tuna species: 1,422 Swordfish: 307	1 6
Tuna pole	Both	169	TAE	5,204	1
West Coast rock lobster	Both	1,053	TAC	1,619 (illegal: estimated at 500 tonnes)	Under revision (Draft Red status at time of publishing)
White mussel	Inshore	200	TAE	605,792 mussels	1

Note: Reported landings are for the most recent year with information publicly available (predominantly 2014 and 2015).
Source: This has been compiled by WWF, taken from various data sources, see references.

FIGURE 7: KEY STATISTICS FOR SOUTH AFRICAN FISHERY SECTORS



Seafood sustainability trends

Major seafood suppliers, restaurant chains and retailers have started to respond to growing markets for sustainable seafood

There is growing awareness of the environmental impacts of fishing on our oceans and there is growing evidence that consumers and retailers alike are increasingly seeking sustainable seafood alternatives. Consumer surveys conducted by WWF’s Southern African Sustainable Seafood Initiative (WWF-SASSI) indicate that consumers are more aware of sustainable seafood challenges and are holding their seafood vendors accountable for the sustainability of the seafood they are selling.

Major seafood suppliers, restaurant chains and retailers have also started to respond to growing markets for sustainable seafood by setting challenging targets and adopting credible seafood sustainability strategies in order to meet them.

FIGURE 8: NUMBER OF WWF-SASSI ASSESSMENTS AND FISHERIES UNDER IMPROVEMENT

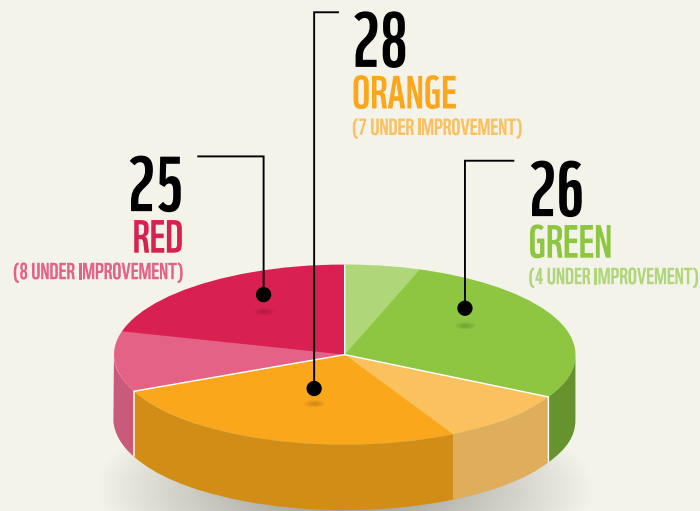
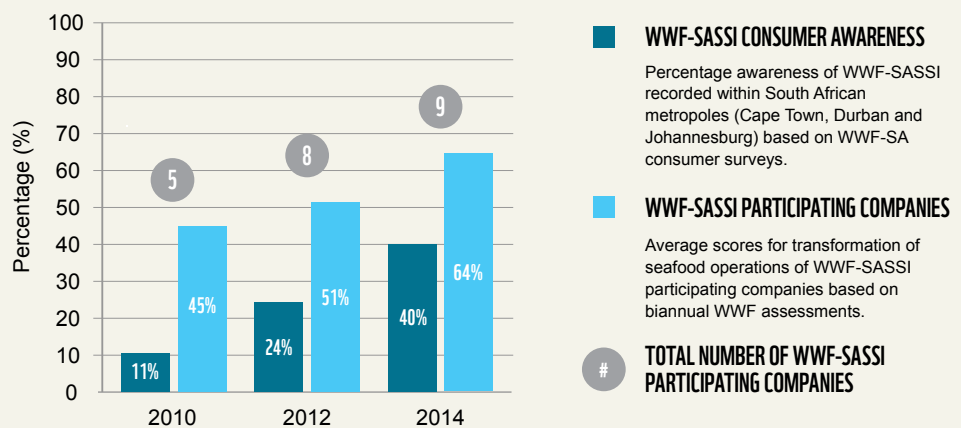


FIGURE 9: THE GROWING INFLUENCE OF WWF-SASSI



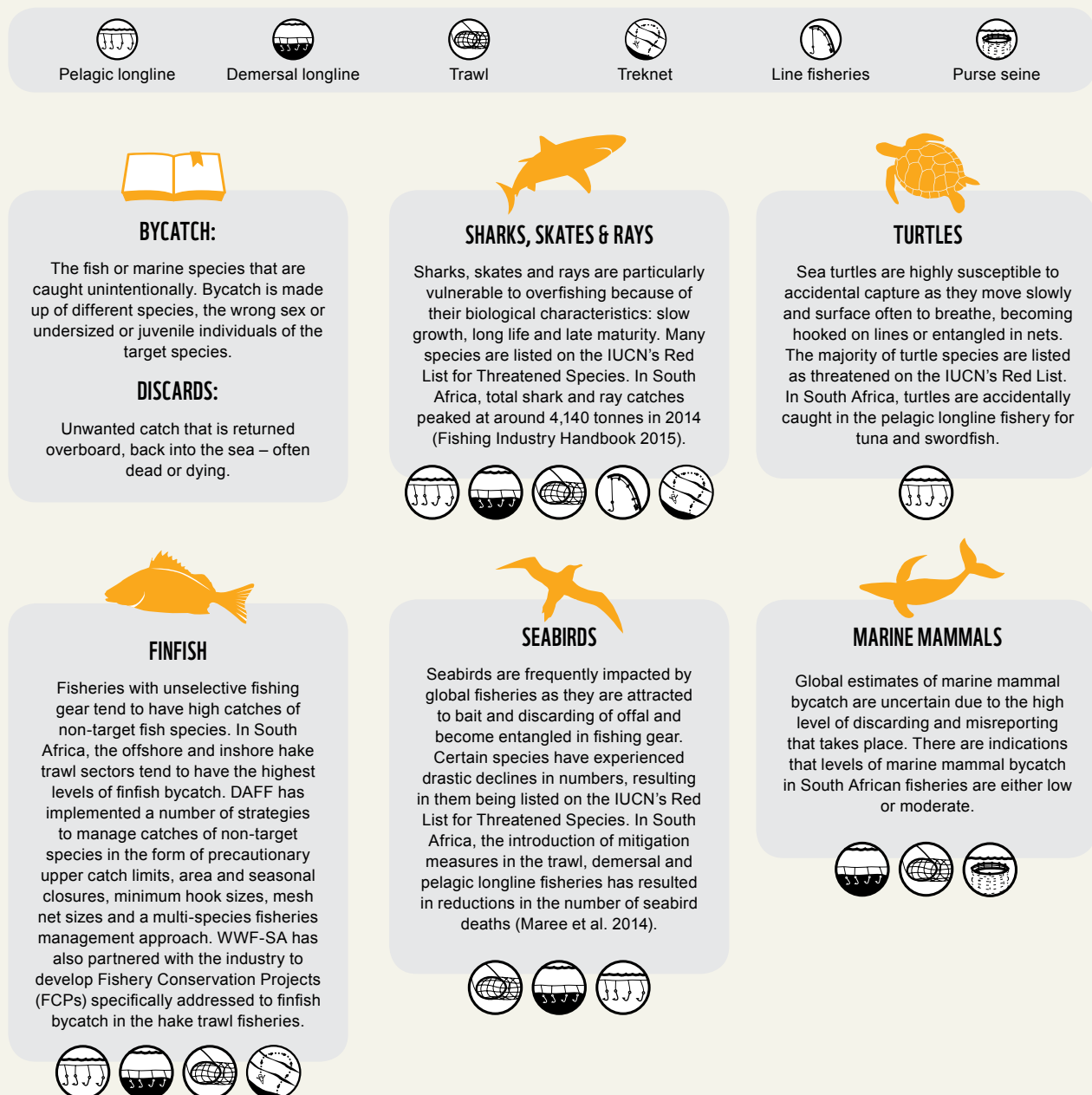
FISHING: CHALLENGES

7.3 MILLION
TONNES OF FISHERIES'
DISCARDS PER YEAR
GLOBALLY

Bycatch and ecosystem impacts

One of the key challenges with marine wild-capture fisheries is the unintentional capture of species that are either unused or unmanaged. By some estimates, this figure may constitute up to 40% of global marine catches (Davies et al. 2009). Part of this figure includes fisheries' discards which have been estimated at approximately 7.3 million tonnes per year globally (Kelleher 2005). Total bycatch (catch of non-target species) is significantly larger than this figure for discards, as many of these non-target species are landed and used for non-food applications such as fishmeal and fertilisers. Furthermore, there are indications that these statistics could be substantially underestimated (Pauly et al. 2015).

FIGURE 10: UNWANTED CATCHES



Governance

After South Africa's transition to a constitutional democracy in the 1990s, poor coastal fishing communities that had been marginalised under apartheid policies had expectations of increased access to marine resources. Although multiple reform and transformation measures have since been implemented, dwindling resources, increasing criminalisation and conflicts around rights allocation have created significant governance challenges.

In 2012, DAFF's Policy for the Small-Scale Fisheries (SSF) sector was gazetted to improve co-management and redress the exclusion of traditional/artisanal fishers from the commercial fishing sector. By 2016, more than 230 fishing communities had expressed interest in being recognised under this policy, which is in the process of being rolled out across the country with fishing right allocations anticipated in late 2016.

Further governance challenges surround the recreational fishing sector as there are no legal requirements to submit catch returns and the total catches by this sector are largely unknown (Smith & Kruger 2013).

KEY GOVERNANCE ISSUES

Appropriate data collection especially for non-target or bycatch species

Government funding is often lacking and in some progressive fisheries, industry funds scientific observer programmes.

Social and economic well-being of fishers and dependent communities

There is a lack of information on what constitutes minimum viable economic fishing rights and the economic benefits provided by fisheries in the form of income and jobs to wider communities. More research is urgently needed.

Poor compliance with existing management frameworks for target stocks

A number of fish stocks, such as abalone, West Coast rock lobster, harder and some linefish species, are considered to be depleted or overfished. However, within these fisheries poaching is considered to be high – and increasing.

Co-management and transparency

Top-down fisheries management has significant limitations and there is a need for improved partnerships between government, resource users and civil society.

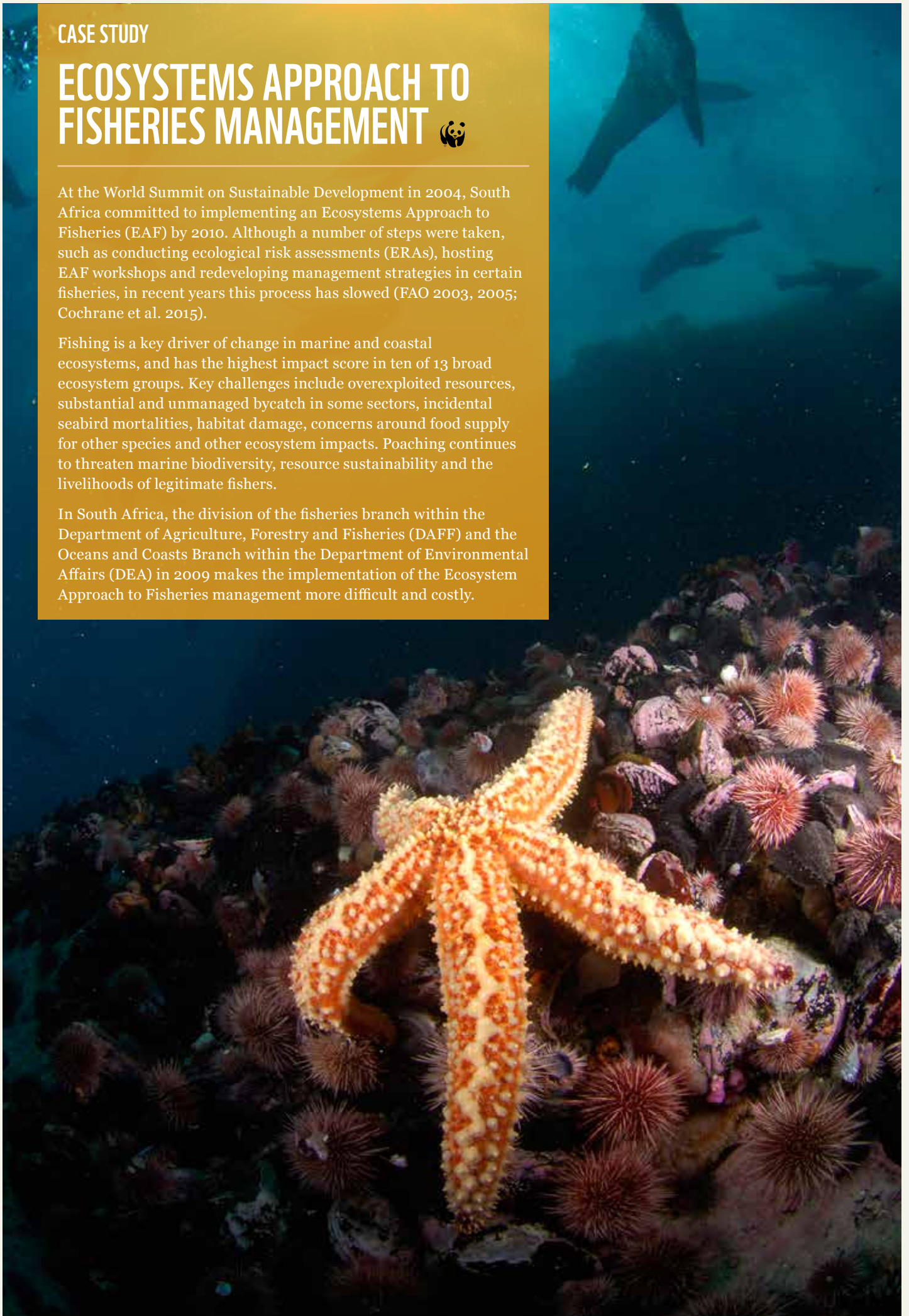
CASE STUDY

ECOSYSTEMS APPROACH TO FISHERIES MANAGEMENT

At the World Summit on Sustainable Development in 2004, South Africa committed to implementing an Ecosystems Approach to Fisheries (EAF) by 2010. Although a number of steps were taken, such as conducting ecological risk assessments (ERAs), hosting EAF workshops and redeveloping management strategies in certain fisheries, in recent years this process has slowed (FAO 2003, 2005; Cochrane et al. 2015).

Fishing is a key driver of change in marine and coastal ecosystems, and has the highest impact score in ten of 13 broad ecosystem groups. Key challenges include overexploited resources, substantial and unmanaged bycatch in some sectors, incidental seabird mortalities, habitat damage, concerns around food supply for other species and other ecosystem impacts. Poaching continues to threaten marine biodiversity, resource sustainability and the livelihoods of legitimate fishers.

In South Africa, the division of the fisheries branch within the Department of Agriculture, Forestry and Fisheries (DAFF) and the Oceans and Coasts Branch within the Department of Environmental Affairs (DEA) in 2009 makes the implementation of the Ecosystem Approach to Fisheries management more difficult and costly.



AQUACULTURE: GLOBAL TRENDS

89%
OF GLOBAL AQUACULTURE
PRODUCTION OCCURS
IN ASIA

Global fish catches have levelled off since the mid- to late 1990s and wild-capture fisheries have struggled to meet a growing demand for seafood. In contrast the aquaculture sector has grown rapidly due to developing technologies and increasing efficiency, providing more fish for human consumption than wild-capture fisheries for the first time in 2014 (FAO 2016).

Aquaculture contributes half (50.4%) of the total fish production for human consumption globally, which equals 73.8 million tonnes (FAO 2016) valued at US\$160,2 billion (R1.5 trillion). The majority of aquaculture production occurs in Asia (89%), with other continents making up the difference: the Americas: 4%, Europe: 4%, Africa: 2% and Oceania: <1% (FAO 2015).

Although more than two-thirds of the global aquaculture production for human consumption came from inland aquaculture, it only accounted for just over half (56.5%) the global value of aquaculture with mariculture accounting for 43.5% of the value (FAO 2014). Approximately 12% of the world's population was dependent on fisheries and aquaculture to secure their livelihoods in 2012 (FAO 2016). Of this, 33% was engaged in fish farming.

AQUACULTURE: LOCAL TRENDS

The commercial aquaculture industry in South Africa is relatively new in comparison to commercial wild-capture fisheries, however, it is growing steadily. Total production was 4,802 tonnes in 2013, which represents an increase of 18% compared to the previous year (DAFF 2015). In 2012 the aquaculture industry contributed only approximately 0.8% to South Africa's fish production (Operation Phakisa Aquaculture Lab Report 2014).

There are operational aquaculture farms in all of South Africa's provinces (DAFF, 2015), however, not all farms produce at a commercially viable scale. In 2013, 2,831 people were employed by the aquaculture sector, with the majority employed in the Western Cape (65%).



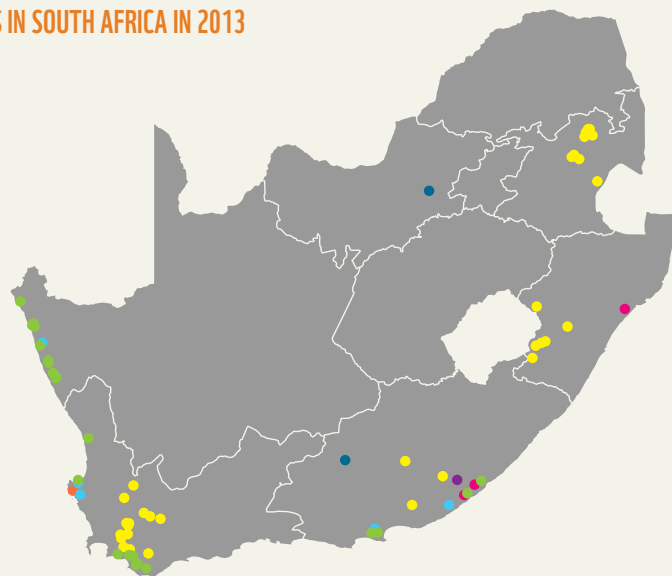
AQUACULTURE STEWARDSHIP COUNCIL

Certification schemes are becoming more prevalent in many aquaculture operations that primarily export to lucrative markets in the developed world. One of these certifications is the Aquaculture Stewardship Council (ASC) which aims to transform aquaculture towards environmental sustainability and social responsibility using efficient market mechanisms that create value across the supply chain.

AQUACULTURE: CHALLENGES

South Africa has a shortage of clean freshwater (DAFF 2013) and many aquaculture operations rely on freshwater during the production process. This is of significant environmental concern, especially if discharge from aquaculture operations contaminates existing freshwater supplies. A number of the species farmed in South Africa were originally invasive – such as trout, mussels and oysters. If released into natural ecosystems, these species compete with indigenous species for habitat and food and can cause ecosystem shifts where they become dominant. There is also a skills shortage and a limited knowledge base which inhibits the growth of the sector. This is relevant in the case of feed which is typically imported due to a lack of expertise and facilities to develop local feed of an acceptable quality.

FIGURE 11: AQUACULTURE FARMS IN SOUTH AFRICA IN 2013



Note: Freshwater data from 2010
 Source: Operation Phakisa: Unlocking the Economic Potential of South Africa's Oceans (2014) Lab Report – Aquaculture

TABLE 3: SOUTH AFRICAN AQUACULTURE PRODUCTION AND VALUE (FOR HUMAN CONSUMPTION) IN 2013

SPECIES	MAP KEY	NUMBER OF FARMS	PRODUCTION (TONNES)	% OF TOTAL PRODUCTION	VALUE (R; MILLIONS)	ESTIMATED % OF TOTAL VALUE
Abalone (<i>Haliotis midae</i>)	●	20	1,469.8	30.6	529	76.0
Finfish	●	5	122.6	2.6	6	0.9
Mussels (<i>Mytilus galloprovincialis</i> , <i>Choromytilus meridionalis</i>)	●	4	1,116.1	23.2	20	2.9
Oysters (<i>Crassostrea gigas</i>)	●	9	277.2	5.8	16.9	2.4
Total Marine		36	2,985.7	62.2	571.9	82.2
Tilapia (<i>Oreochromis mossambicus</i> , <i>O. niloticus</i> , <i>O. rendalli</i>)	Locations not available	97	289.7	6.0	9.9	1.4
Trout (<i>Oncorhynchus mykiss</i> , <i>Salmo trutta</i>)	●	47	1,521.7	31.7	113	16.3
Catfish (<i>Clarias gariepinus</i>)	●	10	0	0	0	0
Marron crayfish (<i>Cherax tenuimanus</i>)	●	1	5	0.1	1	0.1
Total Freshwater		193	1,816.4	37.8	123.9	17.8
Total Aquaculture		229	4,802.1	100	696	100

COASTAL DEVELOPMENT: GLOBAL TRENDS

Approximately three billion people live on the relatively small area – about 4% – of the Earth's surface that's within 200km of the coast (UNEP 2006). By 2025 the coastal population is likely to double (Creel 2003), with as much as 91% of the world's coastline likely to be affected by some form of development (Sale et al. 2008). Many of the world's coasts are becoming increasingly urbanised; 13 of the world's 20 megacities (cities containing more than ten million people) are located along the coast, and nearly 700 million people live in low-lying coastal areas that are less than ten metres above sea level (UNDP 2011).

NEARLY
700 MILLION
PEOPLE LIVE IN LOW-LYING
COASTAL AREAS

Changes in the size, composition and distribution of human populations affect coastal regions by changing land use and land cover. With the increasing pressure on coastal resources, a number of adverse environmental trends have emerged. It's been estimated that half of the world's wetlands disappeared in the 20th century and that 50% of all mangroves, and nearly 60% of the world's coral reefs are seriously degraded – in some cases beyond recovery – by development and other human activities (Creel 2003).

COASTAL DEVELOPMENT: LOCAL TRENDS

South Africa has one of the highest coastal population densities in Africa with approximately 80 people per square kilometre, compared to the average density of 55 people per square kilometre elsewhere on the continent (DEA 2010).

63%
OF SOUTH AFRICA'S GDP
IS CONTRIBUTED BY OUR
COASTAL RESOURCES

The estimated total contribution of coastal resources (without regulatory services) to the South African economy is approximately R57 billion. The direct economic benefits from coastal resources – including the marine fishing industry, port and harbour development, and the attractive lifestyles, recreation and tourism opportunities offered by a coastal location – are estimated to be around 35% of South Africa's annual GDP. Indirect economic benefits include erosion control provided by coastal features, such as dunes and high cliffs, which protect the built and natural features along the coast (including roads, buildings and farmlands) from the damaging effects of waves and wind. Coastal resources also allow waste assimilation, detoxification and recycling through coastal wetlands, forests and grasslands. These indirect benefits account for an additional 28% of the country's GDP (DEA 2014).

COASTAL DEVELOPMENT: CHALLENGES

About 17% of South Africa's coast has some form of development within 100m of the shoreline.

The interacting pressures of coastal development and climate change threaten beaches, dunes, other coastal habitats and their underlying processes – this can disrupt critical ecosystem services. Inappropriate coastal development compromises ecosystem services and hampers our ability to adapt to climate change.

22%
OF SOUTH AFRICA'S
COASTAL DEVELOPMENTS
ARE THREATENED BY
SEA-LEVEL RISE

Approximately 22% of coastal developments are threatened by sea-level rise (based on development within 50m of the shore). This increases to nearly a third of coastal developments (31%) if this is extended to include any development within 100m of the shore. Impacts up to 100m inland were shown to occur in erosion hotspots following the storm surge along the East coast of South Africa in March 2007. Thus, there is a strong possibility that localised damages of this nature could occur more frequently in the next decade (Sink et al. 2011).

CASE STUDY

TRANSPORT, HARBOURS & COMMUNICATIONS

South Africa is undisputedly a maritime country. Some 95% of the country's trade volume (80% by value) is seaborne (Chasomeris 2005). Total imports and exports contribute 60% of South Africa's GDP, and 98% of international-bound trade is carried by more than 12,000 deep-sea trading vessels through our waters per annum. South Africa's commercial ports are important for the economic growth and development of the entire southern African region, handling over 48 million containers in 2014.

The South African marine manufacturing industry includes all businesses involved in the design, manufacture, construction, repair and maintenance of ocean-going vessels and their components, as well as the management of ship yards, dry docks, marine repair shops and similar enterprises. The industry is a part of South Africa's proud maritime culture, however, it is in decline. Around 50% of boat builders closed down between 2009 and 2013, and there has been little investment in the modernisation of ship yards since the 1980s. There has also been a steady decline in ship yards; dry docks and floating docks are in a state of disrepair, and urgently need maintenance (BRICS Maritime Forum Report 2013).

Globally, US\$57.2 billion has been invested in fibre optic submarine systems as of mid-2014, contributing 1,275 million kilometres of submarine cable (SIC 2013).



MARINE MINING, OIL & GAS: LOCAL TRENDS

South Africa's offshore oil and gas deposits are relatively small, but its refining and downstream oil sector is developing fast (SA Government 2011). The gas to liquid refinery in Mossel Bay produces 36,000 barrels per day – a crude oil equivalent of 45,000 barrels per day. With the average price for global oil per barrel at US\$76, the total gross output of the refinery was valued at of US\$1.25 billion (R9.4 billion in 2009 Rands).

The coastline of South Africa is mined for heavy metals (titanium and zirconium), mineral sands, and cement and aggregates. South Africa is the African continent's main producer of titanium and zirconium, and supplies 30% of world production (Turpie and Wilson 2011). Mining and quarrying in South Africa contributed US\$26.4 billion or R198 billion (9.1%) to the country's GDP in 2009 (StatsSA 2010), however, it is not known how much of this can be attributed to the coast.

Approximately 98% of South Africa's EEZ is subject to a right or lease for offshore oil and gas exploration or production (Petroleum Agency SA 2016) with the majority of these leases being granted in the past decade. South Africa's government has identified offshore oil and gas as a focus area for rapid development, and through Operation Phakisa, it is aiming to fast-track the drilling of 30 wells in the next ten years and develop infrastructure, such as a phased gas pipeline network (Operation Phakisa 2014).

98%

OF SOUTH AFRICA'S EEZ IS SUBJECT TO A RIGHT OR LEASE FOR OFFSHORE OIL & GAS EXPLORATION OR PRODUCTION

MARINE MINING, OIL & GAS: CHALLENGES

There has also been an increasing number of applications for unconventional offshore oil & gas activities (Rhino Oil and Gas 2015) including PetroSA recently applying for environmental authorisations to undertake hydraulic fracturing (fracking) in the F-O Gas Field off Mossel Bay (Wilson-Späth 2014). Offshore exploration and production is currently poorly regulated – an untenable situation aggravated by little knowledge of its potential impacts on the marine ecosystem and existing marine uses, including fishing.

In 1994, marine mineral concession zones were established on the West Coast of South Africa, stretching from the Orange River mouth to Saldanha, and several marine mining companies have been granted prospecting and mining rights in these concession areas (Atkinson & Sink 2008). The northwestern town of Port Nolloth is the centre of the South African diamond diving industry (Parkins and Field 1998). Here divers extract diamonds from the ocean floor by pulling large suction pipes along the seabed (Pulfrich and Penney 1999).

The Department of Mineral Resources has also granted three prospecting rights for marine phosphate. These rights extend over a considerable portion of South Africa's EEZ, together covering more than 10% of it or 150,000km² (Green Flash Trading 2012a; Green Flash Trading 2012b; Diamond Fields International 2013). The prospecting areas overlap with a number of critically endangered ecosystems and several proposed MPAs (Currie 2013). Furthermore, they directly coincide with several existing fishing grounds. Notably, they overlap with South Africa's only Marine Stewardship Council accredited fishery (Carnie 2012).

Offshore exploration and production is currently poorly regulated – an untenable situation aggravated by little knowledge of its potential impacts on the marine ecosystem and existing marine uses, including fishing

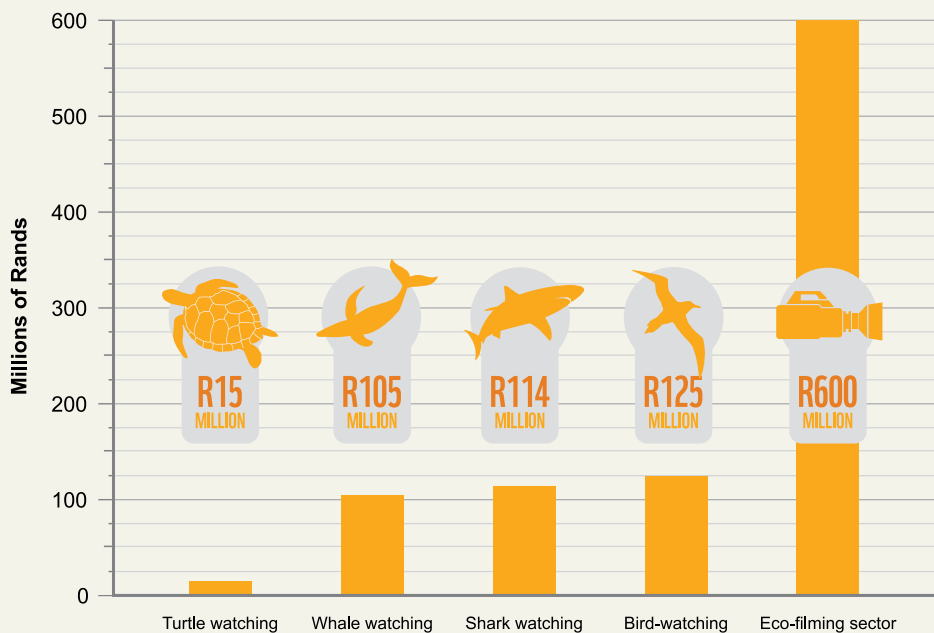
**TOURISM:
LOCAL TRENDS**

South Africa is known as an adventure destination, attracting younger, more active foreign tourists who are looking for diverse experiences and nature holidays that are not offered elsewhere. The coast with its sandy beaches, warm and cold water, and myriad ecotourism activities – snorkelling, scuba diving (including spear fishing), shark diving, whale watching, coastal hiking, bird-watching, game fishing and good surfing – make South Africa the ideal travel destination. More importantly these factors contribute significantly to the country's overall tourism value.

R2.0 BILLION
THE VALUE OF
ECOTOURISM TO THE
SOUTH AFRICAN ECONOMY

According to the 2014 State of the Ocean and Coasts Report the direct value of marine ecotourism sector to the South African economy was estimated at R400 million and its indirect value at more than R2 billion (DEA 2015). While the direct contribution of coastal tourism to national income was US\$1734 million (R26 billion in 2009 Rands) (Turpie & Wilson 2011). In 2014, global tourism linked to the scenic beauty and recreational opportunities of coastal areas was estimated at nearly US\$30 billion (over R426 billion) for nature-based and dive tourism in coral reefs (Wynberg & Hauck 2014). The City of Cape Town Report (Thornton 2014) reflects that visiting the beach constituted 12% of all foreign visitors' activities during their stay in Cape Town.

FIGURE 12: THE VALUE OF SOUTH AFRICA'S MARINE WILDLIFE VIEWING



Source: DEA State of the Oceans and Coasts around South Africa 2014.



CASE STUDY

A TOURIST DRAW CARD

The number of visitors to the Simon's Town penguin colony has increased from 200,000 in 1998 to approximately 662,000 in 2013 making it the fifth most visited tourist site in Cape Town (Van Zyl 2014). The tourist expenditure is estimated at approximately R160 million per annum with 35% of this spent within Simon's Town (Van Zyl 2014).

The Sardine Run on the east coast of the country was estimated to have a direct value of R5.4 million (Dicken & Hosking 2009; Dicken 2010). This value is based on both boat-based diving and photographic packages. The Sardine Run no longer attracts only the scientific and filming fraternities, but also commercial dive operators, with the number of boats increasing from two in 2000 to 29 in 2001. Boat-based viewing of the run has also become a lucrative business with the number of boats increasing from a single boat in 2000 to 25 in 2001 (Dicken 2010).

It is estimated that Durban beaches, with their warm water, are some of the most popular beaches in South Africa. In 2008, the suspension of the Blue Flag status of beaches in Durban is estimated to have cost the South African tourism industry an estimated R100 million per year (Lucrezi & van der Merwe 2015). An average of 12 million local visitors travelled within South Africa from 2010 to 2013 and up to 50% of their time was spent at the beach (Thornton 2014).

INDIRECT IMPACTS OF ECONOMIC ACTIVITY: GLOBAL TRENDS

Land-based sources of pollution, such as agricultural run-off, discharge of nutrients and pesticides, untreated sewage and plastic waste, account for approximately 80% of marine pollution globally (UNEP-GPA 2009; IOC/UNESCO 2011). Excess nutrients from sewage outfalls and agricultural run-off have contributed to the number of low-oxygen (hypoxic) areas known as dead zones, where most marine life cannot survive, resulting in the collapse of some ecosystems. There are now close to 500 dead zones around the world, covering more than 245,000km² (Diaz & Rosenberg 2008).

> 8 MILLION
TONNES OF PLASTICS ENTER THE OCEAN EACH YEAR

It is estimated that at least eight million tonnes of plastics enter the ocean each year, which is equivalent to dumping the contents of one garbage truck into the ocean every minute (World Economic Forum et al. 2016). If no action is taken, this is expected to increase to two per minute by 2030 and four per minute by 2050. In a business-as-usual scenario, the ocean is expected to contain one tonne of plastic for every three tonnes of fish by 2025, and by 2050, more plastics than fish [by weight] (World Economic Forum et al. 2016).

INDIRECT IMPACTS OF ECONOMIC ACTIVITY: LOCAL TRENDS

South African waters are increasingly impacted by a number of sources of pollution, including land-based effluent, rubbish and oil spills (DEA 2012). Wastewater that is discharged into the ocean environment is generally composed of municipal wastewater (domestic sewage), industrial waste water and storm-water flow. There are more than 60 licensed pipelines which discharge effluent along the South African coast (DEA 2012). In 2008, DEA reported that approximately 287 million m³ of wastewater per annum is discharged into the marine environment from land-based sources (DEA 2012).

>60
LICENSED PIPELINES DISCHARGE EFFLUENT ALONG THE SOUTH AFRICAN COAST

Plastics make up 90% of all large debris stranded on South African beaches (DEA 2012). Plastics that are repeatedly exposed to wave action, salt water and the sun break down into microplastics that continue to exist in the marine environment for years (IOI 2010). Seabirds and other marine life frequently ingest these plastics.

12,000
SHIPS VISIT SOUTH AFRICA'S PORTS EACH YEAR

South Africa is positioned along one of the world's busiest shipping routes with more than 120 million tonnes of oil and bunker fuel carried aboard ships each year and 12,000 ships visiting South Africa's ports (Rantsoabe 2014). Combined with the harsh oceanographic conditions along the coast, this renders the country especially vulnerable to oil spills. A number of oil spills locally have had significant effects on marine life, including the Apollo Sea oil spill in 1994 and the Treasure oil spill in 2000 which affected some 40,000 penguins.

FRESHWATER FLOW REDUCTION IMPACTS MARINE, COASTAL & ESTUARINE ECOSYSTEMS

40%

LESS FRESH WATER IS ENTERING OUR ESTUARIES

Approximately 40% of the flow from South Africa's 20 largest catchments no longer reaches the estuaries concerned.



THE WHOLE SOUTH AFRICAN COAST HAS BEEN EFFECTED

Impacts have occurred along the entire South African coast, but are expected to be more severe in the nutrient-poor marine environment of the east coast.



FRESH WATER CONNECTS THE LAND AND SEA

A reduction in the flow of freshwater can uncouple critical ecological linkages between terrestrial and marine environments.



REDUCED FRESHWATER FLOW AFFECTS ECOLOGICAL PROCESSES

The impacts of reduced freshwater input on marine biodiversity and resources include those on physical habitat, reduced nutrient inputs and alterations to important ecological processes, such as nursery functions, food webs and energy flow.



FRESHWATER INPUT MEANS MORE ABUNDANT MARINE LIFE

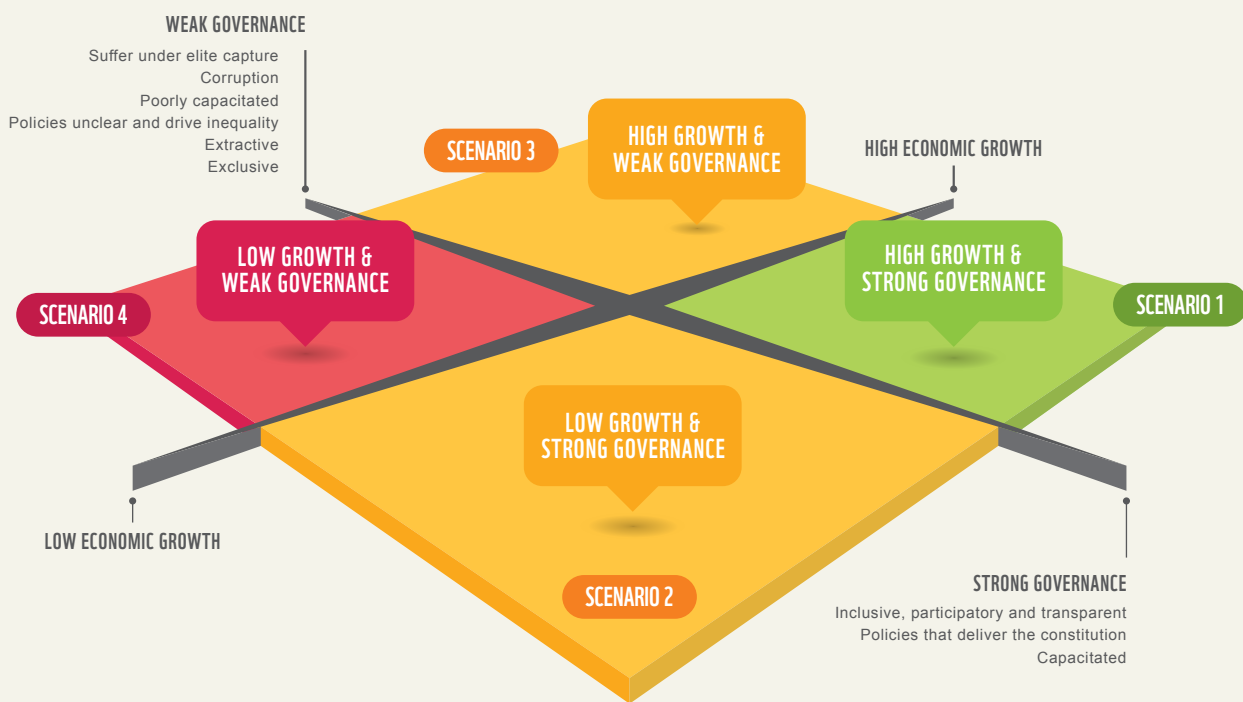
Freshwater input has been linked to marine resource abundance, including the abundance of linefish, such as slinger and kob, more than 40km offshore on the Thukela banks in KwaZulu-Natal.

2036 OCEAN SCENARIOS

What our future oceans will look like depends on a number of variables and our responses to a changing world.

We asked a panel of marine experts to provide insights into what our oceans may look like twenty years from now. The following scenarios were developed through a deductive scenario planning workshop where participants identified two overarching critical uncertainties likely to shape the future. These uncertainties then provided the framing for the four scenarios described below. Expert ocean scenarios contributors are listed on the inside cover page of this report.

FIGURE 13: SOUTH AFRICA'S FUTURE OCEAN SCENARIOS



SCENARIO 1

**HIGH ECONOMIC
GROWTH WITH
STRONG, INCLUSIVE
GOVERNANCE
INSTITUTIONS**

*With the strong
global economy,
marine and coastal
tourism is booming*

While offshore resources, such as hake and small pelagics continue to operate at maximum sustainable yield, other high-value inshore resources recover as a result of improved governance and marine spatial planning processes.

With the establishment of functional small-scale fisheries cooperatives, effective co-management frameworks and the demarcation of small-scale fishing community areas, poverty and illegal fishing within coastal communities have been reduced.

Improved integration across government departments has resulted in greater revenues as both inshore and offshore fisheries are able to access high-value niche markets through MSC certification and locally-driven programmes with retailers and restaurants. While aquaculture remains a relatively small contributor to national food security and income, the sector continues to grow sustainably in line with an effective environmental management regime. Through the development of alternative livelihoods programmes, small-scale aquaculture projects are linked to existing commercial aquaculture value chains along the coast to provide decent jobs and food security. This in turn reduces illegal harvesting and the reliance of small-scale fishers on depleted coastal resources.

With the strong global economy, marine and coastal tourism is booming. As most coral reefs around the world have succumbed to coral bleaching, tourists are willing to pay top dollar for rare interactions with near-pristine marine ecosystems. Through effective benefit-sharing structures, the increased revenue generated by tourism contributes to biodiversity conservation efforts within MPAs and the creation of livelihood opportunities. While coastal developments continue to transform the coastline, the implementation of the national coastal management plan and coastal set-back lines keeps coastal ecosystems relatively intact and are able to protect coastal infrastructure and property, and buffer against disturbances associated with climate change.

As a result of increased global commodity prices for all minerals and petroleum products, a number of marine oil, gas and mining operations are active in South Africa's EEZ. An effective network of offshore MPAs and "no-go" areas provides protection to ecologically and biologically significant areas and marine mining is completely excluded from coastal zones and key food production areas. Revenues and taxes from mining operations are used to help fund infrastructure, provide jobs and further increase local economic growth.

Despite improved marine governance and an effective Marine Spatial Planning framework, there are increasing tensions between environmental and growth priorities, particularly between mining and fishing interests.

SCENARIO 2

**LOW ECONOMIC
GROWTH WITH
STRONG, INCLUSIVE
GOVERNANCE
INSTITUTIONS**

MPAs are increasingly supported by surrounding communities

Despite the depressed global economy, the hake trawl fishery continues to operate profitably and sustainably as its MSC certification has enabled it to diversify and access new markets.

In the inshore zone, the general state of the economy raises the social imperative of meeting coastal communities' basic food security needs. This immediate need outweighs long-term sustainability goals and fishing pressure is still too high to enable the recovery of inshore resources.

Tourism is one of the few sectors showing signs of growth, as South Africa remains a popular destination as a result of the weak exchange rate. Local tourism is also on the rise as foreign destinations are too expensive. Coastal development is focused on small, community-driven projects with improved small fishing harbours. New capital-intensive projects for large-scale oil, gas and marine mining have been put on hold as economic and environmental cost-benefit studies suggest that they will add little value to the economy.

Due to improved co-management and benefit sharing arrangements, MPAs are increasingly supported by surrounding communities as the associated tourism activities provide a more reliable income stream than fishing operations. However, there are growing conflicts within coastal communities as poor economic growth places further pressure on household income and growing migration from the interior of the country has led to the rapid expansion of coastal towns. These conflicts are exacerbated by climate change, as many of the new informal settlements are regularly destroyed by extreme weather events.

While aquaculture remains a relatively small sector, with the markets for high-valued species remaining stagnant, interventions such as Operation Phakisa to link emerging small-scale aquaculture operators to commercial value chains have started to unlock opportunities for coastal communities. Overall, while food security remains a challenge for some communities, government's integrated approach to community self-development is helping them to meet their basic food needs. However, with growing coastal populations and limited livelihood options, coastal ecosystems continue to deteriorate outside of dedicated MPAs.

SCENARIO 3

**HIGH ECONOMIC
GROWTH AND
WEAK, EXCLUSIVE
GOVERNANCE
INSTITUTIONS**

An increasing number of mining rights are granted annually as they are seen as an additional revenue stream and source of potential livelihoods

Despite weak global economic growth, there is an increase in off-shore mining activities as a result of a weak regulatory system and government's desire to realise short-term ocean economy returns.

An increasing number of mining rights are granted annually as they are seen as an additional revenue stream and source of potential livelihoods.

With the loss of the hake trawl fishery's MSC certification due to the absence of critical fisheries management functions, the industry has lost access to high-value developed world markets. As a result, the sector is less profitable and has shed a large number of jobs. With government departments suffering from critical capacity shortages, there is ongoing uncertainty around the long-term tenure of fishing rights and growing user conflicts between fisheries and the oil & gas and marine mining sectors. With reduced profits, industry has not been able to support fisheries research and there are increasing uncertainties in fisheries models raising concerns around the sustainability of offshore resources.

In the nearshore zone, after two decades of heavy fishing pressure, there are only a limited number of vessels still active. Many of the key linefish species are heavily depleted and some are no longer commercially viable. Coastal communities are increasingly harvesting intertidal resources and coastal MPAs have been opened to fishing in an attempt to meet short-term food security needs, significantly reducing the oceans' ability to provide a sustainable source of protein. Government has invested heavily in the aquaculture sector in an effort to stimulate economic growth but the focus on large-scale operations has brought benefits to only a limited number of private companies.

Bolstered by the weak Rand/Dollar exchange rate, South Africa has become a target destination for foreign tourists. As an important sector for job creation and poverty alleviation, tourism – along with coastal mining operations – is prioritised and drives coastal development. As a result of poor institutional oversight, many of these developments occur in ecologically sensitive areas. The increased pressure on these systems results in recruitment failure for a number of linefish species.

SCENARIO 4

**LOW ECONOMIC
GROWTH WITH
WEAK, EXCLUSIVE
GOVERNANCE
INSTITUTIONS**

Without an effective marine spatial planning framework, a number of mining and oil & gas rights have been granted in key fisheries areas, some of which are starting to show signs of declining productivity as benthic habitats are irreversibly impacted by mining operations.

South Africa's oceans have become highly contested spaces. Due to pressure from the marine extractive industries, offshore MPAs have not been proclaimed. In 2025, weak enforcement of environmental regulations resulted in an oil spill on the West Coast.

Coastal communities are suffering as most small-scale fisheries cooperatives have been dissolved due to corruption and elite capture. Declining government capacity and the lack of effective co-management structures have resulted in overfishing in the inshore zone and increased levels of illegal fishing along the coast. In an effort to appease fishing communities, a number of coastal MPAs have been opened to fishing and catch levels inside the MPAs are now comparable to surrounding areas with implications for food security and economic development for those dependent on them.

Increasing demand for minerals, coupled with new technology, has resulted in coastal strip mining and coffer dams in multiple locations along the coast. Poor integration with local economic development plans have resulted in the privatisation of the coastline, further exacerbating inequality and the exclusion of communities. The increased traffic of oil & gas rigs has also brought with it a number of new invasive marine species, some of which have negatively impacted the emerging aquaculture sector.

Tourist numbers are now starting to drop off in many coastal towns, as key ecotourism activities are no longer able to provide reliable sightings. Crime has also become a significant deterrent.

While the high levels of economic growth have led to a growing national economy, this wealth is enjoyed by only a privileged few. With weak and corrupt governance institutions in place, society is suffering from high levels of instability. Crime and social uprisings are more commonplace as inequality, poverty and food insecurity are exacerbated by weak governance and the ongoing deterioration of marine ecosystems.

While the high levels of economic growth have led to a growing national economy, this wealth is enjoyed by only a privileged few

OCEAN FUTURES: A CALL TO ACTION

Our oceans are a significant contributor to South Africa's wellbeing but their ecological foundations are threatened by unsustainable use and ineffective management.

To secure the ocean's productive capacity, and a sustainable future for all, we must take urgent action. WWF-SA's Marine Programme is working with partners across multiple sectors to create this future.

INTEGRATED OCEAN MANAGEMENT, MARINE SPATIAL PLANNING AND MPAS

A key solution to addressing many marine challenges is an integrated approach to ocean management which recognises the full range of interactions within an ecosystem (including social systems), rather than focusing on individual uses, species, or ecosystem services, with a focus on maintaining ecosystem service function. A critical component of this approach is spatial planning, which allows for areas to be prioritised, such as those important for biodiversity protection, mining "go" or "no-go" areas, and fisheries priority areas. WWF's Marine Programme works with a range of partners to identify the most significant and sensitive places for both wildlife and people.

Marine Protected Areas (MPAs) are a key element of an integrated approach and have been widely advocated as an effective tool for securing and restoring the health of our oceans. WWF is committed to finding ways to make MPAs work for ocean ecosystems and the coastal communities who rely on them for their livelihoods.

SAFEGUARDING SEABEDS



Our seabed habitats are under threat. There is an urgent need to address the risks that marine mining, in particular bulk sediment extraction, poses to our marine ecosystems in the short-term. It is clear that the long-term implications of granting marine prospecting rights are not being adequately considered; this presents imminent threats to our marine ecosystems and associated industries (such as fisheries). The high levels of uncertainty surrounding mining coupled with the speed at which prospecting applications are currently being submitted and granted, suggests that there is a short timeframe in which to act before the inertia of the system becomes too great and irreparable damage is done. Through the Safeguard Our Seabed Coalition, WWF is working with multiple partners to ensure that decisions around our oceans future are made on the best possible science and policy.

IMPLEMENTING AN ECOSYSTEM APPROACH TO FISHERIES MANAGEMENT

South Africa has committed to implementing an Ecosystem Approach to Fisheries (EAF) management which aims to protect marine ecosystems, including their human components, as a whole. Although much good science exists to further the implementation of an EAF, limited guidance exists for managers. WWF works closely with government and other key stakeholders around the implementation of an EAF through the development of practical tools and resilience plans for key fisheries.

**EMPOWERING
CONSUMERS
AND MARKETS**



Consumers have the power to drive positive change on the water by supporting responsible suppliers and sellers who source sustainable seafood from well-managed, sustainable fisheries.

WWF's Southern African Sustainable Seafood Initiative (WWF-SASSI) empowers consumers to make sustainable seafood choices by providing them with easy-to-use information about their seafood. WWF also works with the major national retailers and restaurant franchises and their suppliers to develop sustainable sourcing policies and in so doing creates market incentives that can drive transformation in key fisheries.

**INDUSTRY
WORKING
TOGETHER**

Driving improvement on the water requires everyone to pull in the same direction. Through the Responsible Fisheries Alliance (RFA), WWF and like-minded fishing companies and NGOs are working together to ensure that healthy marine ecosystems underpin southern Africa's seafood industry. The RFA's activities are designed around strategic objectives, such as influencing policy and facilitating the sharing of information to effect responsible fishing practices.



WWF is also driving change on the water through Fishery Improvement Projects (FIPs) and Fishery Conservation Project (FCPs). These multi-stakeholder projects are developed collaboratively between WWF, government and different fishery sectors and use the power of the private sector and markets to incentivise positive changes toward sustainable practices.

**COMMUNITY
STEWARDSHIP**

Healthy marine ecosystems should benefit those who rely on them for their livelihoods. WWF works with fishing communities and various stakeholders to address some of the key environmental and social challenges facing South Africa's small-scale fisheries. One flagship initiative is in Kleinmond in the Western Cape. The first of its kind in the country, this project is built on the premise that small-scale fisheries need to be both socially and environmentally sustainable in order to sustain livelihoods. During 2015 and 2016, the project partners – together with the community – have begun implementing an holistic workplan to achieve resilient fisheries.

SCORECARD CRITERIA & DATA SOURCES

SCORECARD CRITERIA

Coastal livelihoods

- Red – Small-scale fishing communities have not been allocated formal rights under the small-scale fisheries policy
- Orange – Small-scale fishing communities have been identified and allocated fishing rights according to the small-scale fisheries policy
- Green – Small-scale fishing communities identified and allocated rights according to the small-scale fisheries policy, functional cooperatives are established and participating in local fisheries management decisions

Sustainable seafood availability

- Red – Major retailers and suppliers have no sustainable seafood policies in place
- Orange – Major retailers and suppliers have sustainable seafood policies in place
- Green – Major retailers and suppliers have sustainable seafood policies in place and are on track towards meeting commitments

Ecosystem Approach to Fisheries implementation

- Red – Independent fisheries data is not being collected annually for key commercial fisheries
- Orange – Independent commercial fisheries data collection is occurring annually, participatory fisheries management structures in place which include government, industry and civil society, TACs are set in line with ecologically sustainable limits
- Green – Independent commercial fisheries data collection is occurring annually, participatory fisheries management structures in place which include government, industry and civil society, TACs are set in line with ecologically sustainable limits, fisheries are managed in accordance with agreed-upon management plans

Marine spatial planning

- Red – No formal marine spatial planning legislation in place
- Orange – Marine spatial planning legislation in place recognising all key marine users
- Green – Marine spatial planning legislation in place recognising all key marine sectors. Rights granted in accordance with spatial plan

Illegal, unreported and unregulated fishing

- Red – Illegal fishing activities are measured
- Orange – Illegal fishing activities are measured and an agreed upon strategy to address IUU is in place
- Green – Illegal fishing activities are measured and an agreed upon strategy to address IUU is in place and illegal fishing is being reduced

African penguins:

- Crawford, R. J. M., Williams, A. J., Hofmeyr, J. H., Klages, N. T. W., Randall, R. M., Cooper, J., B.M. Dyer & Chesselet, Y. (1995). Trends of African Penguin *Spheniscus demersus* populations in the 20th century. *South African Journal of Marine Science*, 16(1), 101-118.
- Kemper, J., Underhill, L. G., Crawford, R. J., & Kirkman, S. P. (2007). Revision of the conservation status of seabirds and seals breeding in the Benguela Ecosystem. *Final report of the BCLME (Benguela Current Large Marine Ecosystem) project on top predators as biological indicators of ecosystem change in the BCLME*. Avian Demography Unit, Cape Town, 697-704.
- Crawford, R.J.M., Altwegg, R., Barham, B.J., Barham, P.J., Durant, J.M., Dyer, B.M., Geldenhuys, D., Makhado, A.B., Pichegru, L., Ryan, P.G. and Underhill, L.G., (2011). Collapse of South Africa's penguins in the early 21st century. *African Journal of Marine Science*, 33(1), 139-156.

West Coast rock lobster:

- CL de Moor, SJ Johnston, A Brandão, RA Rademeyer, JP Glazer, LB Furman & DS Butterworth (2015) A review of the assessments of the major fisheries resources in South Africa, *African Journal of Marine Science*, 37:3, 285-311, DOI: 10.2989/1814232X.2015.1070201
- Target of 35% stock recovery from 2006 levels

Seafood mislabelling:

- Cawthorn D., Steinman H.A. & Witthuhn R.C. (2012). DNA barcoding reveals a high incidence of fish species misrepresentation and substitution on the South African market. *Food Research International*, 46, 30-40.
- Cawthorn D., Duncan J., Kastern C., Francis J. & Hoffman LC. (2015). Fish species substitution and misnaming in South Africa: An economic, safety and sustainability conundrum revisited. *Food chemistry*, 185, 165-181.

WWF-SASSI participants:

- Procurement data provided by SASSI Participant retailers, suppliers and restaurants (Breco Seafoods, Fruit & Veg City/Food Lovers Market, I & J, John Dory's, Ocean Basket, Pick n Pay, SPAR Group Ltd, Sun International and Woolworths)

MPA coverage:

- National Protected Area Expansion Strategy for South Africa (2008). Department of Environmental Affairs
- 10% coverage target taken from Convention on Biological Diversity Conference Of the Parties 10, Aichi Targets: Decision X/2 Strategic Plan for Biodiversity 2011-2020

OCEAN TRENDS DATA SOURCES

REFERENCES

GENERAL

- Agardy, T., Alder, J., Dayton, P., Curran, S., Kitchingman, A., Wilson, M., Catenazzi, A., Restrepo, J., Birkeland, C., Blaber, S., Saifullah, S., Branch, B., Boersma, D., Nixon, S., Dugan, P., Davidson, N. & Vorosmarty, C. 2005a. *Coastal systems -millennium ecosystem assessment: ecosystems and human well-being*. Island Press, Washington D.C. 1:513-549.
- Attwood, C. G., Harris, J. M. & Williams, A. J. 1997. *International experience of marine protected areas and their relevance to South Africa*, South African Journal of Marine Science. 18(1):311-332.
- CIA. 2016. World Fact book and Earth Trends <<https://www.cia.gov/library/publications/the-world-factbook/geos/xx.html>> Accessed April 2016.
- Costanza, R., d'Arge, R. de Groot, R., Farberk, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R. V., Paruelo, J., Raskin, R. G., Suttonkk, P. & van den Belt, M. 1997. *The value of the world's ecosystem services and natural capital*. Nature. 387:253-260.
- Feely, R. A., Sabine, C.L., Lee, K., Berelson, W., Kleypas, J., Fabry, V.J. & Millero, F.J. 2004. *Impact of Anthropogenic CO₂ on the CaCO₃ System in the Oceans*. Science. 305 (5682): 362-366.
- Kelleher, G. & Kenchington, R. 1992. *Guidelines for Establishing Marine Protected Areas*. A Marine Conservation and Development Report. IUCN. Switzerland.
- Kenchington, R.A. 1990. *Managing Marine Environments*. Taylor and Francis. New York.
- Convention on Biological diversity - Rio de Janeiro. 1992. <<https://www.cbd.int/doc/legal/cbd-en.pdf>> Accessed April 2016.
- Van Niekerk, L., Adams, J.B., Bate, G.C., Forbes, A.T., Forbes, N.T., Huizinga, P., Lamberth, S.J., MacKay, C.F., Petersen, C., Taljaard, S., Weerts, S.P., Whitfield, A.K. & Wooldridge, T.H. 2013. *Country-wide assessment of estuary health: An approach for integrating pressures and ecosystem response in a data limited environment*. Estuarine, Coastal and Shelf Science. 130: 239-251.
- Wynberg, R. & Hauck, M. 2014. *People, power, and the coast: a conceptual framework for understanding and implementing benefit sharing*. Ecology and Society. 19(1): 27.

ECOSYSTEM SERVICES

- Agardy, T., Alder, J., Ash, N., DeFries, R. & Nelson, G. 2005. Synthesis: condition and trends in systems and services, trade-offs for human wellbeing, and implications for the future. In: Hassan, R., Scholes, R. & Ash, N. (eds). 2005b. *Ecosystems and human well-being: current state and trends: findings of the Condition and Trends Working Group*. Island Press, Washington D.C. 823-834.
- Chasomeris, M. G. 2005. *South Africa's ports performance: policy, pricing and growth*. Department of Economics and Finance, University of Kwa-Zulu Natal. Durban.
- Clark, B. M., Hauck, M., Harris, J. M., Salo, K. & Russell, E. 2002. *Identification of subsistence fishers, fishing areas, resource use and activities along the South African Coast*. South African Journal of Marine Science 24: 425-37.
- CLA Report. 2010. *Coastal Livelihoods Assessment (CLA)*. Agulhas and Somali Current Large Marine Ecosystems Project Programme Report. South Africa.
- Costanza, R., d'Arge, R. de Groot, R., Farberk, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R. V., Paruelo, J., Raskin, R. G., Suttonkk, P. & van den Belt, M. 1997. *The value of the world's ecosystem services and natural capital*. Nature. 387: 253-60.
- DEAT. 2000. *White Paper for sustainable Coastal Development in South Africa, Department of Environmental Affairs & Tourism*. Cape Town.
- Dicken, M. L. 2010. *Socio-economic aspects of boat-based ecotourism during the sardine run within the Pondoland Marine Protected Area, South Africa*. African Journal of Marine Science. 32: 405-411.
- FAO.2014. *The State of World Fisheries and Aquaculture*. Food and Agricultural Organisation of the United Nations. Rome.
- FAO. 2016. *The State of World Fisheries and Aquaculture 2016, Contributing to food security and nutrition for all*, UN Food and Agricultural Organisation. Rome.
- Hoegh-Guldberg, O. et al. 2015. *Reviving the Ocean Economy: the case for action - 2015*. WWF International, Gland, Switzerland., Geneva, 60 pp
- McGrath, M. D., Horner, C. C. M., Brouwer, S. L., Lamberth, S. J., Mann, B. Q., Sauer, W. H. H. & Erasmus, C. 1997. *An economic valuation of the South African linefishery*. South African Journal of Marine Science 18: 203-211.
- Rouault M, Penven P & Pohl B. 2009. *Warming of the Agulhas Current since the 1980s*. Geophysical Research Letters. 36.
- Scholes, B., Scholes, M. & Lucas, M. 2015. *Climate Change: Briefings from Southern Africa*. Wits University Press. Johannesburg.
- Statistics South Africa. 2010. *Gross Domestic Product*. <www.statssa.gov.za> Accessed April 2016.
- Trade and Industry Chamber. 2007. *Administered Prices Study on Economic Inputs: Ports Sector*. Fund for Research into industrial development, growth and equity (FRIDGE). South Africa.
- Turpie, J. & Wilson, G. 2011. *Cost/benefit assessment of marine and coastal resources in the western Indian Ocean: Mozambique and South Africa*. Agulhas and Somali Current Large Marine Ecosystems Project Report. South Africa.
- UNESCO. 2004. *Research shows the oceans becoming more acidic*. UNESCO Press Release. <http://portal.unesco.org/en/ev.phpURL_ID=21758&URL_DO=DO_TOPIC&URL_SECTION=201.html>. Accessed 17 March 2016.
- WWF South Africa Report. 2014. *From boat to plate, linking the seafood consumer and supply chain*. WWF-SA. Cape Town.
- Wynberg, R., & Hauck, M. 2014. *People, power, and the coast: a conceptual framework for understanding and implementing benefit sharing*. Ecology and Society. 19(1): 27.

FISHERIES

- Agnew D.J., Pearce J., Pramod G., Peatman T., Watson R., Beddington JR, & Pitcher TJ. 2009. *Estimating the worldwide extent of illegal fishing*. PLoS One. 2009;4(2):e4570. doi: 10.1371/journal.pone.0004570. Epub 2009 Feb 25.
- Attwood, C.G. 2013. *Background to the theme: A decade after the emergency*, In: Attwood, C., Booth, T., Kerwath, S., Mann, B., Marr, S., Duncan, J., Bonthuys J. & Potts, W. (eds). 2013. A Decade After the Emergency: The Proceedings of the 5th Linefish Symposium, WWF Report Series – 2013/Marine/001, Cape Town.
- Commission for the Conservation of Southern Bluefin Tuna (CCSBT). 2015. <<http://www.ccsbt.org/site/>> Accessed April 2016.
- Cochrane, K. L., Joyner, J. Sauer, W & Swan J. 2015. *Informing effective policies for responsible marine fisheries in South Africa*. A report prepared for WWF: South Africa and the Responsible Fisheries Alliance. Rhodes University. Grahamstown.
- DAFF 2014. Status of the South African Marine Resources Report 2014. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries. Cape Town.
- Davies, R.W.D., Cripps, S.J., Nickson, A. & Porter G. 2009. *Defining and estimating global marine fisheries bycatch*. Marine Policy. 33(4):661-672.
- FAO. 2003. *The ecosystem approach to fisheries*. FAO Technical Guidelines for Responsible Fisheries. Vol 4(2). Rome.
- FAO. 2005. *Putting into practise the ecosystem approach to fisheries*. Food and Agricultural Organisation of the United Nations. Rome.
- Griffiths, M.H. 2000. *Long-term trends in Catch and Effort of Commercial Linefish off South Africa's Cape Province: Snapshots of the 20th Century*. South African Journal of Marine Science. 22: 81-110.
- IUCN. 2015. The IUCN red list for threatened and endangered species. <<http://www.iucnredlist.org/>> Accessed April 2016.
- Indian Ocean Tuna Commission (IOTC). 2015. <<http://www.iotc.org/>> Accessed April 2016.
- International Commission for the Conservation of Atlantic Tunas (ICCAT). 2015. <<https://www.iccat.int/en/assess.htm>> Accessed April 2016.
- Kashorte, M. 2003. *Moving subsistence fisheries to commercial fisheries in South Africa*. Department of Environmental Affairs and Tourism; Branch: Marine and Coastal Management. Cape Town.
- Kelleher, K. 2005. *Discards in the world's marine fisheries*. An update. FAO Fisheries Technical Paper. 470. Rome.
- Leibold, M. & van Zyl, C. 2008. *The Economic Impact of Sport & Recreational Angling in the Republic of South Africa*. Report of Development Strategies International Pty. Ltd. South Africa.
- Maree, B.A., Wanless, R.M., Fairweather, T.P., Sullivan, B.J. & Yates, O. 2014. *Significant reductions in mortality of threatened seabirds in a South African trawl fishery*. Animal Conservation. 17(6): 520-529.
- Pauly, D. & Zeller, D. 2016. *Catch reconstructions reveal that global marine fisheries catches are higher than reported and declining*. Nature communications. 7(10244): 1-9.
- Smith, M.K.S. & Kruger, N. 2013. *The recreational and subsistence linefisheries in the Knysna and Swartvlei Estuaries – some concerns and management challenges*. In: Attwood, C., Booth, T., Kerwath, S., Mann, B., Marr, S., Duncan, J., Bonthuys J. & Potts, W. (eds). 2013. A Decade After the Emergency: The Proceedings of the 5th Linefish Symposium, WWF Report Series – 2013/Marine/001. Cape Town.
- WWF. 2015. Fishing problems: Pirate Fishing. <http://wwf.panda.org/about_our_earth/blue_planet/problems/problems_fishing/fisheries_management/illegal_fishing/> Accessed April 2016.
- World Bank 2012. World Development Indicators Databank <<http://databank.worldbank.org/ddp/home.do?Step=3&id=4>.> Accessed April 2016.
- Commercial Fisheries Table Sources:**
- Britz, P. 2016. Presentation on abalone given to the DAFF Abalone Indaba held on 3 Feb 2016. Cape Town.
- DAFF. 2005. Policy on the allocation and management of commercial fishing rights in the Demersal Longline Fishery: 2005. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries, Cape Town.
- DAFF. 2013a. Policy on the allocation and management of commercial fishing rights in the Demersal Shark Fishery: 2013. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries, Cape Town.
- DAFF. 2013b. Policy on the allocation and management of commercial fishing rights in the Hake Handline Fishery: 2013. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries, Cape Town.
- DAFF. 2013c. Policy on the allocation and management of commercial fishing rights in the Netfish Fishery: 2013. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries, Cape Town.
- DAFF. 2013d. Policy on the allocation and management of commercial fishing rights in the Prawn Trawl Fishery: 2013. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries, Cape Town.
- DAFF. 2013e. Policy on the allocation and management of commercial fishing rights in the White Mussel Fishery: 2013. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries, Cape Town.
- DAFF. 2014a. Hake/sole inshore trawl TAC allocation for 2014. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries, Cape Town.
- DAFF. 2014b. Status of the Marine Resources Report 2014. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries, Cape Town.
- DAFF. 2015a. Policy on the allocation and management of commercial fishing rights in the Abalone Fishery: 2015. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries, Cape Town.
- DAFF. 2015b. Policy on the allocation and management of commercial fishing rights in the West Coast Rock Lobster Fishery: 2015. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries, Cape Town.
- DAFF. 2015c. Recommendation of the Demersal Scientific Working Group for the sustainable management of Agulhas Sole for the 2016 season. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries, Cape Town.
- DAFF. 2015d. Recommendations of the Demersal Scientific Working Group for the Sustainable Management of Horse Mackerel for the 2016 season. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries, Cape Town.
- DAFF. 2015e. Policy on the allocation and management of commercial fishing rights in the Large Pelagic Longline Fishery: 2015. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries, Cape Town.
- DAFF. 2015f. Recommendation for the sustainable management of the linefish resource for 2015 using a TAE. Department of

- Agriculture, Forestry and Fisheries; Branch: Fisheries, Cape Town.
- DAFF. 2015g. Policy on the allocation and management of commercial fishing rights in the Seaweed Fishery: 2015. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries, Cape Town.
- DAFF. 2015h. Recommendation for the sustainable management of the squid resource for 2015 using a TAE. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries, Cape Town.
- Durholtz, D. 2014. Recommendation of the demersal scientific working group for the sustainable management of horse mackerel for the 2015 season, Scientific Working Group Document for Horse Mackerel - FISHERIES/2014/SWG-DEM. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries. Cape Town.
- Fishing Industry Handbook. 2013. Fishing Industry Handbook for South Africa, Namibia and Mozambique: 2013. I & J. George Warman Publications. Cape Town.
- Fishing Industry Handbook. 2015. Fishing Industry Handbook for South Africa, Namibia and Mozambique: 2015. I & J. George Warman Publications. Cape Town.

Table Sources:

- Anchor. 2015. Assessment of the Socio-Economic Implications of a Reduced Minimum Sardine TAC for the Small Pelagics Purse-Seine Fishery. Anchor Environmental Report. Cape Town.
- Britz, P.J., Brenne, L., Krohn, R. & Chikumira, G. 2015. Development of a Medium-Term Branding Strategy for South African Abalone Exports. Report for TIPS-Department of Trade and Industry. Cape Town.
- Cochrane, K.L., B. Oliver, W. Sauer. 2014. An assessment of the current status of the Chokka Squid fishery in South African and an evaluation of alternative allocation strategies. *Marine Policy*. 43: 149-163.
- DAFF. 2014b. Status of the Marine Resources Report 2014. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries, Cape Town.
- De Greef, K. and S. Raemaekers. 2014. South Africa's Illicit Abalone Trade: An Updated Overview and Knowledge Gap Analysis. TRAFFIC International. Cambridge.
- Lalleman, P., Venter, C., Purves, M., Bergh, M., Thompson, E. & Hansen, M. 2014. *An Analysis of the Economic Benefits of MSC Certification for the SA Hake Fishery*, Demersal Scientific Working Group Document – FISHERIES/2014/SEP /SWG-DEM/46b. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries. Cape Town.
- Lalleman, P., Bergh, M., Hansen, M. & Purves, M. 2016. *Estimating the economic benefits of MSC certification for the South African hake trawl fishery*. Fisheries Research. 182:98-115.
- Sauer, W.H.H., Hecht, T. Britz, P.J. & Mather, D. 2003. *An Economic and Sectoral Study of the South African Fishing volume 1*. Report prepared for Marine and Coastal Management by Rhodes University. South Africa.

AQUACULTURE

- DAFF. 2014. A Profile of the South African aquaculture market value chain. <<http://www.nda.agric.za/doiDev/sideMenu/Marketing/Annual%20Publications/Commodity%20Profiles/Livestock/Aquaculture%20market%20value%20chain%20profile%202014.pdf>>. Department of Agriculture, Forestry and Fisheries; Directorate: Marketing. Cape Town.
- DAFF.2015. Aquaculture Yearbook - 2014. Department of Agriculture, Forestry and Fisheries; Branch: Fisheries; Chief Directorate: Aquaculture and Economic Development. Cape Town.
- Department of Planning, Monitoring and Evaluation. 2014. Operation Phakisa: Unlocking the Economic Potential of South Africa's Oceans. Lab Report, <<https://www.google.co.za/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=lab%20report%20-%20aquaculture>> Accessed April 2016.
- FAO.2014. The State of World Fisheries and Aquaculture. Food and Agricultural Organisation of the United Nations. Rome.
- FAO. 2015. FAO Global Aquaculture Production database updated to 2013 – Summary information, <<http://www.fao.org/3/a-i4899e.pdf>> Accessed April 2016.
- FAO. 2016. *The State of World Fisheries and Aquaculture 2016, Contributing to food security and nutrition for all*, UN Food and Agricultural Organisation. Rome.

COASTAL DEVELOPMENT, COMMUNICATIONS, TRANSPORT & HARBOURS

- BRICS. 2013. BRICS Maritime Forum Report <<http://www.khumo-group.co.za/reports/BRICS-Maritime-Trade-Forum-Report-2013.pdf>> April 2016.
- Creel, L. 2003. *Ripple effects: population and coastal regions*. Population Reference Bureau, Measure Communication.
- Department of Environmental Affairs. 2014. South Africa's National Coastal Management Programme. Cape Town.
- DEA. 2015. State of the Oceans and Coasts around South Africa 2014. Department of Environmental Affairs Report. Cape Town.
- Diaz, R.J. & Rosenberg, R. 2008. *Spreading Dead Zones and Consequences for Marine Ecosystems*. Science. Vol. 321, Issue 5891, pp. 926-929.
- DEAT. 2000. *White Paper for sustainable Coastal Development in South Africa*, Department of Environmental Affairs & Tourism. Cape Town.
- Hermes, J.N. 2011. *Insights into impacts of climate change on the South African Marine and Coastal Environment*. South African Environmental Observation Network (SAEON). Pretoria.
- IOI, 2010. International Ocean Institute. <<http://www.ioinst.org/>> Accessed March 2016.
- IOC/UNESCO. 2011. *A Blueprint for Ocean and Coastal Sustainability*. International Ocean Commission and United Nations Educational, Scientific and Cultural Organisation. Paris.
- World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company. 2016 The New Plastics Economy – Rethinking the future of plastics. (2016, <http://www.ellenmacarthurfoundation.org/publications>).
- Rantsoabe, S. 2014. *Review of South Africa's marine pollution prevention measures, particularly those regarding vessel-source oil pollution*. MSC Thesis. World Maritime University. Sweden.
- Sale, P.F., Butler IV, M.J., Hooten, A.J., Kritzer, J.P. Lindeman, K.C., Sadovy de Mitcheson, Y. J., Steneck, R.S., & van Lavieren, H. 2008. *Stemming Decline of the Coastal Ocean: Rethinking Environmental Management*, UNU-INWEH, Hamilton, Canada.
- SIC. 2013. *Submarine Industry Cable Report—Issue 2*. Prepared by Terabit Consulting. Massachusetts.

Sink K, Holness S, Harris L, Majiedt P, Atkinson L, Robinson T, Kirkman S, Hutchings L, Leslie R, Lamberth S, Kerwath S, von der Heyden S, Lombard A, Attwood C, Branch G, Fairweather T, Taljaard S, Weerts S, Cowley P, Awad A, Halpern B, Grantham H, Wolf T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria. Pp 325

UNEP. 2006. *Marine and coastal ecosystems and human well-being: A synthesis report based on the findings of the Millennium Ecosystem Assessment*. United Nations Environment Programme. Kenya.

UNEP-GPA. 2009. Facts and Figures on Marine Pollution. <<http://www.unesco.org/new/en/natural-sciences/ioc-oceans/priority-areas/rio-20-ocean/blueprint-for-the-future-we-want/marine-pollution/facts-and-figures-on-marine-pollution/>> Accessed April 2016.

MINING

Allsopp, M., Miller, C., Atkins, R., Roccliffe, S., Tabor, I., Santillo, D. & Johnston P. 2013. Review of the Current State of Development and the Potential for Environmental Impacts of Seabed Mining Operations. Greenpeace Research Laboratories Technical Report (Review). 1-50.

Atkinson, L. & Sink, K. 2008. *User profiles for the South African offshore environment*. SANBI Biodiversity Series 10. South African National Biodiversity Institute, Pretoria.

Carnie, T. 2012. *Mining search granted offshore*. The Mercury <<http://www.iol.co.za/mercury/mining-search-granted-offshore-1211410>> Accessed June 2016.

Currie, J. 2013. *Brief Overview of Potential Ecosystem Impacts of Marine Phosphate Mining in the Western Cape, South Africa*.

Department of Planning, Monitoring and Evaluation. 2014. Operation Phakisa: Offshore Oil and Gas Final Lab Report-2014 Cape Town.

Diamond Fields International. 2013. *Environmental Management Plan for the proposed Marine Phosphate Prospecting by Diamond Fields International Ltd in the Outeniqua West Licence Area on the Eastern Agulhas, Offshore Mossel Bay*. Diamond Fields International Ltd. Cape Town.

EPA Northern Territory. 2012. Interim Report: Seabed Mining in the Northern Territory. Seabed Mining Report. Australia.

EPA New Zealand. 2014. *Decision on marine consent application: Chatham Rock Phosphate Limited to mine phosphorite nodules on the Chatham Rise*. Chatham Rock Phosphate Limited. New Zealand.

Green Flash Trading. 2012a. *Environmental Management Plan in the ocean off Cape Columbine and Cape Infanta, Western Cape Province*. Green Flash Trading 257 (Pty) Ltd. Cape Town.

Green Flash Trading. 2012b. *Environmental Management Plan in the ocean off Adam Se Baai and the area to the south towards Table Bay, Western Cape Province*. Green Flash Trading 251 (Pty) Ltd. Cape Town.

Midgley, J., 2012. *Environmental Impact Assessment Report for the Marine Component of the Sandpiper Project. Proposed recovery of phosphate enriched sediments from the marine Mining Licence Area No. 170 off Walvis Bay Namibia*. Namibian Marine Phosphate (Pty) Ltd. Namibia.

Petroleum Agency SA <www.petroleumagency.com> Accessed April 2016

Pulfrich, A. & Penney, A.J. 1999. *The effects of deep-sea diamond mining on the benthic community structure of the Atlantic 1 Mining Licence Area: annual monitoring report—1998*. Prepared by Pisces Research and Management Consultants & the University of Cape Town for De Beers Marine (Pty) Ltd. Cape Town.

Rhino Oil & Gas Exploration. 2015. *Proposed exploration activities in various inshore licence blocks off the South-West Coast of South Africa*. Rhino Oil & Gas Exploration South Africa (Pty) Ltd. South Africa.

South African Government. 2011. *South Africa's Energy Supply*. <www.southafrica.info> Accessed May 2011.

Wilson-Sp ath, A. 2014. *Fracking the ocean*. News24. <<http://www.news24.com/Columnists/AndreasSpath/Fracking-the-ocean-20141103>> Accessed June 2016.

TOURISM

CLA Report. 2010. *Coastal Livelihoods Assessment (CLA)*. Agulhas and Somali Current Large Marine Ecosystems Project Programme Report. South Africa.

DEA. 2015. *State of the Oceans and Coasts around South Africa 2014*. Department of Environmental Affairs. Cape Town.

Dicken, M. L. 2010. *Socio-economic aspects of boat-based ecotourism during the sardine run within the Pondoland Marine Protected Area, South Africa*. African Journal of Marine Science. 32: 405-411.

Dicken, M. L. & Hosking, S. G. 2009. *Socio-economic aspects of the tiger shark diving industry within the Aliwal Shoal Marine Protected Area, South Africa*. African Journal of Marine Science. 31: 227-232.

Lucrezi, S. & van der Merwe, P., 2015. *Beachgoers' awareness and evaluation of the Blue Flag Award in South Africa*. Journal of Coastal Research. 31(5): 1129-1140.

Thornton, G. 2014. *Research on the Monitoring of Trends in Economic Value of Tourism in Cape Town. National Tourism Data Projection and Tourism Enterprise Survey Projection for 2013*. Report for the City of Cape Town. Cape Town.

Van Zyl, H.W. 2014. *The Economic Value and Contribution of the Simon's Town Penguin Colony*. Report for the City of Cape Town. Independent Economic Researchers, Cape Town.

Wynberg, R., & Hauck, M. 2014. *People, power, and the coast: a conceptual framework for understanding and implementing benefit sharing*. Ecology and Society. 19(1): 27.

INDIRECT IMPACTS

Petroleum Agency SA <www.petroleumagency.com> Accessed April 2016

Department of Planning, Monitoring and Evaluation. 2014. Operation Phakisa: Offshore Oil and Gas Final Lab Report-2014 Cape Town.

South Africa's oceans by numbers

42%

of South Africa's key marine fisheries resources are overexploited

<0.5%

of South Africa's mainland ocean ecosystems are formally protected by area

30%

of South Africa's population live within 60km of the coast

R327.6 trillion

total monetary value that the oceans have been estimated to contribute to human welfare per year



Why we are here

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

wwf.org.za