Summary Box: The South African Ocean Environment

Under international law South Africa exercises jurisdiction over its internal waters, territorial waters, contiguous zone, EEZ and continental shelf. Currently the extent of South Africa's EEZ is approximately 1 553 000 km² while a claim for an additional 1 137 000 km² adjoining South Africa's mainland EEZ and 1 200 000 km² adjoining the EEZ surrounding the Prince Edward Island Group has been lodged with the appropriate United Nations international authority. Comparatively, South Africa comprises 1 200 000 km² of terrestrial jurisdiction. Once South Africa's continental shelf extension claims have been processed, and if they are successful, South Africa will enjoy marine usage rights over an area of almost four million km². With the additional shelf claims South Africa will potentially exercise spatial jurisdiction over one of the world's largest EEZs.

Some 10 000 species of marine plants and animals have been recorded in South Africa, that is, almost 15% of the global marine species diversity. In broad terms, plants and animals are distributed according to the distinctive physical characteristics of the different regions. South Africa is privileged to have jurisdiction over a vast area of the world's ocean. South Africa's marine area represents a national asset of immense current and future value.

The ocean environment around Southern Africa is one of the most varied in the world. The strong oceanographic differences are reflected in the general division of South African marine biodiversity into three broad biogeographic regions (excluding the Prince Edward Island Group) namely, the cool temperate West Coast, the warm temperate South Coast and the subtropical East Coast.

The complex current systems adjacent to South Africa result in a biodiversity complement and range that is unique and requires management and conservation prioritisation. The physical environment also presents South Africa with several economic opportunities such as mining, fishing, shipping and tourism. The national and global significance of the Southern African oceans also serves as a major attractor for scientific research programmes.



SOURCE: ASHLEY NA DOO

3. THE DEPARTMENT OF ENVIRONMENTAL AFFAIRS' OCEAN MANDATE

The management, conservation and protection of the environment of South Africa fall within the mandate and responsibilities of the DEA. This mandate is derived from the Constitution, domestic legislation, and relevant international agreements and extends to South Africa's terrestrial, coastal and ocean zones. The DEA currently describes its role of managing, conserving and protecting the environment through the vision of "a prosperous and equitable society living in harmony with our natural resources".^{xi} Environmental management approaches are aimed at protecting and preserving environmental integrity in order to ensure the availability of ecosystem services for current and future generations.

The DEA contributes both directly and indirectly to many of the rights contained in South Africa's Constitution. However, its primary responsibility is to give content to s24 of the Constitution which reads as follows:

"Everyone has the right:

- (a) to an environment that is not harmful to their health or well being; and
- (b) to have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that:
 - prevent pollution and ecological degradation;
 - (ii) promote conservation; and
 - secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

The inclusion of s24 in the Bill of Rights places the environmental right on a par with all other rights contained in the Bill of Rights. As one court judgement put it:

"By elevating the environment to a fundamental justiciable human right, South Africa has irreversibly embarked on a road which will lead to the goal of obtaining a protected environment by an integrated approach, which takes into consideration inter alia, socio economic concerns and principles."^{xii}

The DEA bears the responsibility of leading South Africa's environmental initiatives with respect both to the conservation of the marine environment and the setting in place of strategies to ensure the sustainable development of marine resources. Historically, implementation of the DEA's environmental mandate has largely focused on the terrestrial areas of the country. The ocean and coastal ecosystems need to be managed at an equivalent level in order to effectively contribute to environmental integrity. The management of coastal spaces has now been addressed by the Integrated Coastal Management Act^{xiii}. The ocean environmental management policy is aimed at improving the sustainable development, conservation and protection of the living and non living aspects of the ocean.

The absence of an effective environmental management approach has resulted in those sectors of the state and the economy that use the various marine goods and services self regulating activities that are undertaken in the ocean environment. However, this is done with regard to their respective economic mandates and does not always adequately consider the environmental management mandate of conservation and protection, in particular with regards to the accumulated and aggregated human use impacts across sectors. At a global level, it is increasingly emerging that conservation, protection and sustainability of ocean environmental ecosystem services requires an improved management approach. The DEA supports sustainable development initiatives in the ocean by promoting the understanding of ocean systems and tracking potential changes in how these systems function. Such information is important to other departments and role players that facilitate the strategic direction of ocean based investments.

The development of a South African ocean management policy gives content to the minimum environmental standards contained in s24, which itself reflects the emergent international principles concerning environmental protection. Consequently the application of these principles has been taken into account when considering an appropriate approach to ocean management for South Africa.

The s24 Environmental right mirrors developing international environmental legal principles by including the term "ecologically sustainable development". This wording directly references the international legal principle of "sustainable development". South Africa's courts have described sustainable development as: ^{xiv}

"The fundamental building block around which environmental legal norms have been fashioned, both internationally and in South Africa, and is reflected in s24(b)(iii) of the Constitution. Pure economic principles will no longer determine in an unbridled fashion whether development is acceptable. Development which may be regarded as economically and financially sound will in future be balanced by its environmental impact, taking coherent cognisance of the principle of intergenerational equity and sustainable use of resources in order to arrive at an integrated management of the environment, sustainable development and socio economic concerns."

The DEA's development of an ocean management **policy** for South Africa is being undertaken in accordance with the Constitutional imperative flowing from the s24 Environmental right. It further takes into account South Africa's international obligations with respect to ocean management. South Africa has a host of binding domesticated international obligations with respect to the management of its marine environment. Annexure A contains a table of relevant instruments considered by the DEA in the formulation of this ocean policy. South Africa has embraced the goals of sustainable development and integrated planning when pursuing its ocean environmental management mandate.

South Africa's ocean policy takes cognisance of the following principles articulated in international agreements:

- South Africa is responsible for implementing measures to address the sustainable use of resources in the marine area under its national jurisdiction (including the EEZ);
- South Africa is responsible for implementing measures to address the maintenance of biological diversity in the marine area under its national jurisdiction (including the EEZ);
- South Africa is responsible for implementing measures to undertake research on and the monitoring of the marine area under its national jurisdiction (including the EEZ);
- South Africa is responsible for the integrated management of its ocean environment by pursuing sustainable development and adopting a preventative and precautionary approach (including the EEZ);
- South Africa is responsible for implementing measures to respect international marine usage rules and to
 encourage research and monitoring of the High Seas, Southern Ocean and Antarctica;
- South Africa is responsible for implementing measures to address pollution of the ocean environment from land, sea and air based sources; and
- South Africa is responsible for implementing measures to ensure international and regional cooperation in respect of marine management.

South Africa has passed legislation regulating the marine environment over many years. This domestic legislation was also considered for the purposes of this policy document. A list of the key pieces of legislation considered is contained in Annexure B to this document.

The following observations are relevant to the formulating of South Africa's ocean management policy:

- Prior to 1998 South Africa's domestic legislation with respect to its marine space was largely piecemeal. No
 integrated view was taken of an overall approach to ocean management. The legislation was largely sectoral in
 nature and developed by a particular Department that manages a specific economic sector in order to regulate
 the functions and activities of rights holders within the marine environment.
- While certain of the legislation overtly references international legal principles such as sustainable development, integrated ocean management and the preservation of ecosystem services, they generally fail to consider the cumulative effects of the totality of human activities within the marine environment.
- There is a multiplicity of role players pursuing activities and/or tasked with responsibilities with respect to the marine environment. These include all three spheres of government, a significant number of state owned enterprises and private companies. There does not appear to be a "central authority" tasked with exercising a general oversight of the marine environment in South Africa.
- Since 1998 South Africa has passed an ambitious suite of National Environmental Management Acts. This
 legislation demonstrates clearly the growing recognition of South Africa's international obligations and
 constitutional management role with respect to the environment. Currently the ocean area has not adequately
 been included in this suite of legislation.
- The suite of environmental legislation recognises that:
 - Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.
 - Development must be socially, environmentally and economically sustainable.
 - Sustainable development requires the consideration of all relevant factors.
- Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle. The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment.
- There must be intergovernmental co ordination and harmonisation of policies, legislation and actions relating to the environment.
- Global and international responsibilities relating to the environment must be discharged in the national interest.
- The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.
- The costs of remedying pollution, environmental degradation and consequent adverse health effects and of
 preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be
 paid for by those responsible for harming the environment.
- Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, islands
 and similar systems require specific attention in management and planning procedures, especially where they are
 subject to significant human resource usage and development pressure.

In general, South Africa has passed appropriate domestic legislation and regulations which reflect its constitutional and international obligations. However, South African domestic legislation is premised on sectoral planning for the marine environment. A recognised failure of the historical management of marine areas by sovereign states has been the attempt to deal with sectoral pressures by silo. This approach ignores the cumulative effect of sectoral pressures to the marine ecosystem itself. Given increasing knowledge, sovereign marine nations are beginning to shift to a more

proactive system of ocean management. This shift further recognises that the global biosphere behaves as a single system, where the environmental impacts of each nation ultimately affect the whole. This reality has underpinned the formulation of a coordinated response from the community of nations. Coordinated international action is seen as essential to protecting earth's climate, preserving its biodiversity and managing its marine and other common resources.

Summary Box: Department of Environmental Affair's Ocean Mandate

The environmental management, conservation and protection of South Africa's ocean fall within the primary mandate of the DEA. Traditionally sectors of government and the economy that use the various marine goods and services self regulate activities that are undertaken in the ocean and coastal environments. However, this is done with regard to their respective economic mandates and does not always adequately consider the mandate of conservation and protection. It is increasingly emerging that conservation, protection and sustainability of ocean environmental integrity requires an appropriate management framework. This is a distinct function and management regime that is separate from the traditional economic sector approach to management.

For the purposes of the development of South Africa's ocean management policy the DEA has been mindful of its constitutional, domesticated international law objectives and domestic responsibilities. South Africa has embraced the notion of sustainable development and integrated planning when pursuing the protection and preservation of ocean environmental integrity.

South Africa's ocean policy therefore takes cognisance of the following high level principles:

- South Africa is responsible for implementing measures to address the sustainable use of resources in the marine
 area under its national jurisdiction (including the EEZ);
- South Africa is responsible for implementing measures to address the maintenance of biological diversity in the marine area under its national jurisdiction (including the EEZ);
- South Africa is responsible for implementing measures to undertake research on and the monitoring of the marine area under its national jurisdiction (including the EEZ);
- South Africa is responsible for the integrated management of its ocean environment by pursuing sustainable development and adopting a preventative and precautionary approach (including the EEZ);
- South Africa is responsible for implementing measures to respect international marine usage rules and to
 encourage research and monitoring of the High Seas;
- South Africa is responsible for implementing measures to address pollution of the ocean environment from both land and sea based sources;
- South Africa is responsible for implementing measures to ensure international and regional cooperation in respect of marine management;
- There must be intergovernmental co ordination and harmonisation of policies, legislation and actions relating to the environment; and
- Global and international responsibilities relating to the environment must be discharged in the national interest.

4. THE EVOLUTION OF INTERNATIONAL OCEAN GOVERNANCE

a. THE EMERGING GLOBAL OCEAN MANAGEMENT AGENDA

The concept of maintaining ocean environmental integrity is informed by evolving international law obligations aimed at meeting the growing need for sovereign states to include specific coordinated ocean environmental protection in domestic legal instruments. Specific coordinated ocean environmental protection is required to ensure the integrity of ocean ecosystems.

During the 1960s there was increasing international recognition that the global environment was under assault and was unlikely to be able to sustain itself without a change in human behaviour. Any such behavioural changes needed to be undertaken on a global level as the environment knows no human or state boundaries. This realisation raised the urgent need for international cooperation with respect to norm setting on acceptable and sustainable environmental practices. While many nations had already recognised and pursued state specific conservation policies and practices, these were seen to be necessary but not sufficient for the protection of the global environment. A shift from a national conservation approach to a coordinated international approach to environmental management occurred.

This shift was given impetus by the United Nations General Assembly convening the United Nations Conference on Human Environment held in Stockholm in June 1972. The conference resulted in the Stockholm Declaration which provided that, inter alia, "man has a fundamental right to freedom, equality and adequate conditions of life, in an environment where quality permits a life of dignity and well being^{xw}.

The three primary achievements of the conference were: **

- The Stockholm declaration which contained 26 guiding principles on environmental challenges;
- An action plan containing 109 recommendations for international action with respect to environmental management; and
- A framework for the establishment of an organisation to oversee the implementation of the action plan.

The Stockholm Conference saw the creation of the United Nations Environmental Programme ("UNEP"). UNEP's mission is to "provide leadership and encourage partnership in caring for the environment by inspiring, informing and enabling nations and peoples to improve their quality of life without compromising that of future generations".^{3Mil} Perhaps the importance of the Stockholm Declaration was the creation of a high level framework which promoted common environmental management principles, and that increasingly environmental rights are being recognised as fundamental human rights. Following the Stockholm Declaration the approach to environmental norm setting and protection increasingly took place on four different levels:

- Global (international conventions, treaties and protocols);
- Regional (continental conventions, treaties and protocols);
- Sub regional (economic grouping conventions, treaties and protocols); and
- National (domestic legislation).

Following the Stockholm Conference there was recognition of the need for a legal framework to regulate humankind's use of the ocean. This contributed to UNCLOS being finalised in 1982 after 10 years of negotiation. Impetus was given to the initial negotiations by unregulated fishing activity by developed countries in the ocean adjacent to developing and island nations who lacked the resources to directly access these ocean benefits. UNCLOS established the international legal framework for countries to exercise control over a set of defined maritime zones ensuring equitable access of sovereign states to the marine resources within their jurisdiction. UNCLOS also established clear universal ocean management objectives for negotiation by sovereign states. The identification of these objectives was driven by the growing realisation of the need to preserve ocean environmental integrity due to its importance to the global environment.

"The dark oceans were the womb of life: from the protecting oceans life emerged. We still bear in our bodies in our blood, in the salty bitterness of our tears – the marks of this remote past. Retracing the past, man, the present dominator of the emerged earth, is now returning to the ocean depths. His penetration of the deep could mark the beginning of the end for man, and indeed life as we know it on this earth: it could also be a unique opportunity to lay solid foundations for a peaceful and increasingly prosperous future for all people."¹

UNCLOS has established a comprehensive international legal framework for the conservation, protection and use of the ocean environment. This framework is predicated on conferring sovereign jurisdiction to the edge of the EEZ. UNCLOS has, however, struggled to adequately respond in providing a management framework for the ocean falling outside the sovereign jurisdiction of states. To bolster its application in the High Seas agreements such as the Code of Conduct for Responsible Fishing and the Agreement for the Conservation and Management of Straddling and Highly Migratory Fish Stocks were entered into. UNCLOS also established the International Seabed Authority to manage human activity occurring on the seabed in The Area (i.e. of the ocean outside of a state's marine jurisdiction).

Prior to and during the negotiation phases of UNCLOS several sector agreements were concluded which were aimed at managing identified environmental ocean pressures. Key amongst these agreements were the International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties 1969; the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter **197**2; the International Convention for the Prevention of Pollution from Ships 1973; and the Convention on International Trade in Endangered Species of Wild Fauna and Flora 1973 ("CITES").

Concepts emanating from the Stockholm Conference together with ocean environmental objectives identified by UNCLOS required a global and integrated response to environmental and ocean management. This realisation led to the first United Nations Conference on Environmental Development in 1992 ("UNCED or Rio Conference") held in Rio de Janeiro. The Rio Conference resulted in the production of various documents including Agenda 21. Chapter 17 of Agenda 21 advocates an approach to the management of ocean environments by the identification of specified programme areas.

Agenda 21 set out a number of clear principles which expanded upon the right to a healthy and sustainable environment. These principles implicitly recognised the tension between the need to conserve the environment and the need to exploit it (utilise resources). The Conference recognised that the establishment of global norms and standards for the protection of the environment would be meaningless unless nations committed themselves to implementing and enforcing these undertakings at a domestic level. It further recognised that nations would be unlikely to implement norms and standards which undermined their economic activities.

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Simultaneously to Agenda 21 the Convention for Biological Diversity ("CBD") was negotiated. At its highest level the CBD aims to conserve biological diversity, promote the sustainable use of its components and encourage equitable sharing of the benefits arising out of the utilisation of genetic resources. The convention parties meet every two years to negotiate and review progress made against established targets. The primary aspiration of the CBD is to halt or severely curtail the loss of species on the planet. The CBD objectives complemented the existing CITES provisions. CITES regulates international trade in identified endangered species. The listing of endangered species is an ongoing process and species are categorised according to the necessary levels of required protection.

Biodiversity and habitat conservation has driven the international call for sovereign states to establish a representative network of marine conservation areas under their jurisdiction. Cooperation is required with respect to developing management approaches to straddling stocks and highly migratory species which move between the jurisdictions of different coastal states.

There is also recognition that the development of a representative network of marine conservation areas in the High Seas should be established. International law has yet to develop a legal framework in terms of which these networks can be established. A similar challenge is posed when attempting to adopt a coherent approach to rebuilding depleted fish stocks occurring in the High Seas.

Increasingly international instruments began speaking the language of sustainable development. The four recurring elements of sustainable development in international law have been described as¹:

- 1. The principle of intergenerational equity which holds that natural resources must be preserved for the benefit of future generations;
- 2. The principle of sustainable use which holds that natural resources should only be exploited (utilised) in a sustainable, prudent or rational or wise or appropriate manner;
- 3. The principle of equitable use which holds that the exploitation of natural resources must be undertaken in an equitable manner so that exploiting states take into consideration the needs of other states; and
- 4. The integration principle which holds that environmental considerations should be integrated into economic and other development plans, programmes and projects as well as that development needs should be taken into consideration when environmental objectives are applied.

Ten years after Agenda 21 the World Summit on Sustainable Development was held in Johannesburg. The Summit produced the Johannesburg Plan of Action which emphasised an ecosystem approach to protecting and preserving ocean environmental integrity. It described the earth as a functioning system and highlighted the importance of ocean integrity in building resilience to climate change. The Plan of Action defined specific environmental management targets for ocean and coastal spaces with regard to, inter alia, land based sources of pollution, alien invasive species, biodiversity and the sustainable use of living and non living marine resources.

These principles are contained in both Agenda 21 and the Johannesburg Declaration on Sustainable Development. These instruments overtly encourage a global model of sustainable development. The notion of sustainable development is increasingly being recognised in binding treaty law^{xviii}. These emergent legal principles are also being used in conflict resolution fora as well as in supporting the integration of laws and policies at the intersection of international environmental, social and economic law.

b. INTERNATIONAL OCEAN GOVERNANCE FRAMEWORKS AND RESPONSIBILITIES

Major intergovernmental organisations such as UNEP, the United Nations Development Programme ("UNDP") and specialised United Nations agencies and commissions, such as the International Maritime Organisation ("IMO"), the World Meteorological Organisation and the Intergovernmental Oceanographic Commission ("IOC"), bear responsibility for coordinating marine environmental policy at an international level. They pursue an international agenda aimed at environmental protection and the promotion of sustainable development. The foundation for this agenda can be seen as UNCLOS, which 159 nations and the European Union have ratified. Of the major marine nations, only the United States of America ("USA") and Turkey have not as yet done so. A recommendation of the recent USA Presidential Inter Agency Ocean Policy Task Force was that the state should immediately undertake the ratification of UNCLOS. It is UNCLOS that confers on South Africa the rights to use the marine resources contained in its EEZ, as well as the responsibility to conserve and protect this marine environment.

South Africa is responsible under international law to pursue regional planning initiatives in a number of areas, for example, highly migratory fish stocks, straddling stocks and pollution control. South Africa mostly does this through regional economic blocks such as the Southern African Development Community. South Africa also enters into bi lateral and multi lateral agreements with neighbouring states on certain identified subject matter. A recent example of this is the negotiations with respect to the Benguela Current Commission involving Angola and Namibia. The ocean environment surrounding South Africa is of international research significance due to the global impact of its warm and cold regimes mixing over large areas. As such South Africa is well positioned to play an active role as a regional and global centre of ocean and marine research excellence and leadership.

A contributing factor to South Africa's existing marine research capabilities has been the fact that South Africa was one of the original 12 signatories of the Antarctic Treaty and enjoys freedom of scientific investigation and cooperation in the Antarctic. Meetings of the parties are held to further the objectives of the Treaty. The Treaty gives the parties the right to exchange scientific personnel, observations and results. South Africa has maintained a permanent research station in Antarctica for the past 50 years. South Africa has also ratified a number of protocols to the main agreement. One of the protocols deals with environmental protection, while affirming the status of Antarctica as a special conservation area and enhancing the protection of this environment together with its dependant and associated ecosystems. A second instrument caters for the protection of Antarctic fauna and flora while a third protocol covers the conservation of marine living resources in Antarctica. These treaties and protocols have been incorporated into domestic legislation by the Antarctic Treaties Act 60 of 1996.

The DEA bears responsibility for the implementation, monitoring and enforcement of these international and domestic obligations. South Africa is in a privileged position with respect to the ability to pursue research in Antarctica, which can directly improve scientific knowledge into ecosystem functions and services. Increased scientific knowledge directly benefits South Africa's approach to ocean and environmental management and allows South Africa to fulfil its international, continental and regional leadership potential. It is expected that Antarctica and the seas around it will play an increasingly significant geo political role in the coming century.

Ecosystem degradation and climate change have triggered a fundamental shift in international ocean management strategies in recent years. Sovereign states are increasingly moving towards an integrated management approach premised on the regulation of all sectoral activities within their marine environment. This approach is based on the relationship between the totality of human resource usage and its associated cumulative impacts on the marine environment. The adoption of an ecosystem based ocean management approach will greatly enhance South Africa's ability to manage and effectively respond to existing ecosystem degradation or change and improve the sustainable use of South Africa's rich marine ecosystem services.

Summary Box: The Evolution of International Ocean Governance

The concept of maintaining ocean environmental integrity is informed by evolving international law obligations aimed at meeting the growing need for sovereign states to include specific coordinated ocean environmental protection in domestic legal instruments. Specific coordinated ocean environmental protection is required to ensure the integrity of ocean ecosystems.

Concepts emanating from the Stockholm Conference together with ocean environmental objectives identified by UNCLOS required a global and integrated response to environmental and ocean management. This realisation led to the first UNCED or Rio Conference held in Rio de Janeiro in 1992. The Rio Conference resulted in the production of various documents including Agenda 21. Chapter 17 of Agenda 21 advocates an approach to the management of ocean environments by the identification of specified programme areas.

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SOURCE: ASHLEY NAIDOO

5. OCEAN ECOSYSTEM SERVICES AND SUSTAINABLE USE

a. THE OCEAN AND EARTH SYSTEM

The international trend towards developing responsible ocean management policies was fuelled, in part, by the recognition of the need to coordinate different uses and user groups of ocean resources as well as recognising the increasing scientific evidence relating to the importance of the ocean environment in the natural and physical functioning of the planet. This evidence raised awareness that the ocean environment plays significant roles in earth systems functioning and the mitigation of climate change. Climate change is likely to increase potential ocean threats to coastal communities and investments (such as harbours) through exaggerated natural phenomena such as storm surges and sea level rising.

"The ocean plays a complex role in South Africa's climate system. It stores most of the sun's energy that reaches the earth and acts as the earth's most significant global heat buffer. In fact, at least one quarter of earth's anthropogenic (of human origin) surface warming has been absorbed by the ocean, thereby postponing the consequences of our actions, delaying more severe climate change impacts, and buying us time to develop mitigation and adaptation strategies.

The ocean also acts as a giant heat distribution unit, pumping massive amounts of warm water and air toward the poles and cold water and air back to the tropics. These patterns heat places like Europe and New Zealand and cool places like southern California and coastal Peru. The consistency of ocean currents keeps these regions from experiencing large climatic and seasonal swings that they might otherwise experience. Instabilities in the ocean currents caused by climate change could lead to major shifts in regional climate and weather patterns and associated human migrations in the future. Furthermore, the ocean plays a major role in wind and precipitation patterns. Cloud formation (evaporation), cloud movement (wind), and rain/snow (condensation) are all linked to the ocean.

The enormous volume of the ocean allows it to act as a giant reservoir for carbon, soaking up carbon dioxide (CO_2) from the atmosphere. The ocean acts as a buffer for earth's climate. The oceanic uptake of CO_2 has somewhat mitigated the effect of global warming by reducing its concentration in the atmosphere. However, this continual absorption of CO_2 changes the ocean in ways that have potentially dangerous consequences for humans and for marine biodiversity." ^{xix}

The ocean is the largest collector of solar energy on earth as it covers more than 70% of the planet's surface. The sheer size of the ocean gives it the ability to absorb large amounts of heat without a proportionate increase in seawater temperature. The ocean's ability to store and release heat plays a central role in the stabilisation of earth's climate system. Sea surface temperature is important because it determines how much CO_2 can be dissolved into seawater. Seawater which is cold can hold more CO_2 than warmer seawater. It is estimated that 40% of global CO_2 absorption by seawater occurs in the Southern Ocean. Ocean warming holds out the likelihood that the uptake of CO_2 by the ocean may decrease. This may lead to an increase in the acidity of the ocean which will ultimately result in it becoming more corrosive. This in turn will place greater pressure on the ocean's ability to act as a global earth system and climate change buffer.

Emergent science is increasingly regarding the earth as a holistic system, which is integrated and self regulating. Earth science sees the earth as comprised of four major systems or spheres namely: the geosphere, the hydrosphere, the atmosphere and the biosphere. The geosphere comprises all of the cold, hard, solid rock of the planet's crust (surface), the hot semi solid rock that lies underneath the crust, the hot liquid rock near the centre of the planet, and

the solid iron core (centre) of the planet. The hydrosphere contains all of the planet's solid, liquid, and gaseous water. The biosphere contains all of the planet's living organisms and the atmosphere contains all of the planet's air. Research into the interaction between these four spheres has indicated the following:

- The earth system, in many respects, functions as a self regulating system with complex interactions and feedbacks between the spheres;
- Human activities are significantly impacting earth's environment. The impact of anthropogenic activity on the earth's land surface, ocean, coasts, atmosphere, biological diversity, water cycle and biogeochemical cycles are undeniable. Many of these events are increasing and further harm is likely;
- Human driven changes cause effects that cascade through the earth system in complex ways. The effects of
 human activity on the environment can be difficult to understand or predict;
- Human activities can trigger environmental changes with severe consequences for the earth's environment and inhabitants;
- Key environmental parameters indicate that the earth system has moved outside the range of natural variability exhibited over the last 500 000 years. The scale of change is unprecedented and poses significant risk to the environment.^{xx}

Two widely used indicators which highlight the effects of climate change on the marine environment are physical and chemical properties of the ocean: ocean warming and ocean acidification. The ocean surface generally is in a state of equilibrium with the atmosphere with respect to carbon dioxide and heat. Changes in this equilibrium have consequences. Ocean warming leads to ice sheet melting and sea level rises. It also increases the frequency of extreme weather events such as coastal storms. This contributes to the possibility that ocean currents may be impacted, causing changes in regional climate systems. South Africa's ocean has not escaped this warming. With increasing sea surface temperatures, marine species are expected to shift their distribution patterns in response to the changing temperature regimes.



Ocean acidification refers to increasing levels of dissolved carbon dioxide in the ocean. This holds out the possibility of significant impacts on both marine biodiversity and ecosystems. It diminishes the ocean's capacity to act as the earth's biggest carbon sink and renders vulnerable the atmosphere and terrestrial ecosystems.



Diagram: Global Ocean acidification 1985 – 2005 ^{xii}

South Africa's climate change policy notes that:

"Marine ecosystems and species are at risk from changes in water temperature, ocean acidification and from changes in ocean currents such as West Coast upwelling and Agulhas current strengthening. Change in South Africa's marine and coastal environment is already being observed and this change has already had significant impacts on the fisheries sector and on the local economy of small scale and subsistence fishing communities along the West Coast."

The Climate Change Policy requires role playing departments to be mindful of a number of key principles when formulating new policies, programmes or strategies which deal with aspects of environmental regulation. These principles require state bodies to pursue strategies that: ^{xolv}

- Strengthen biodiversity management and research institutions so that they can monitor, assess and respond
 effectively to existing anthropogenic pressures together with the additional pressures that climate change
 presents.
- Conserve, rehabilitate and restore natural systems that improve resilience to climate change impacts or that reduce impacts.
- Prioritise impact assessments and adaptation planning that takes into account the full range of possible climate
 outcomes, in conjunction with plausible scenarios of other stresses.
- Prioritise climate change research into marine and terrestrial biodiversity and ecosystem services, and institute
 effective monitoring to enhance the understanding and forecasting of critical future threats. Monitoring efforts at
 national and sub national scale, supported by experimental studies that quantify future risks to biodiversity and
 that improve projections of impacts, will help to design and refine adaptation responses.
- Enhance existing programmes to combat the spread of terrestrial and marine alien and invasive species, especially in cases where such infestations worsen the impacts of climate change.

- Expand the protected area network (in line with the National Protected Area Expansion Strategy) where it
 improves climate change resilience, and manage threatened biomes, ecosystems, and species in ways that will
 minimise the risks of species extinction.
- Encourage partnerships for effective management of areas not under formal protection, especially freshwater ecosystem priority areas, critical biodiversity areas, ecological support areas and threatened ecosystems.

South Africa's ocean environmental management policy contributes to the global necessity to preserve marine ecosystems. Internationally ocean management regimes include strategies to research, mitigate and adapt to the realities of climate change.

"Climate change will compound the pressures on already stressed ecosystems that have resulted from the unsustainable use and inadequate management of many of South Africa's ecosystems and so potentially reduce the quantity and quality of the services that ecosystems currently provide. These critical services underpin South Africa's socio economic activities. Stressed ecosystems will compromise one of the key responses available to the country to adapt to climate change: using ecosystem services to help society adapt to climate change, known as 'ecosystem based adaptation'"²⁰⁰

b. OCEAN ECOSYSTEMS

The planet's ocean can be viewed as a linked organisation of marine ecosystems. Ecosystem based ocean management "is intended to improve ecosystem health and services by planning human uses in concert with the conservation of important ecological areas, such as areas of high productivity and biological diversity; areas and key species that are critical to ecosystem function and resiliency; areas of spawning, breeding, and feeding; areas of rare or functionally vulnerable marine resources; and migratory corridors."^{novi}

The increase of human activity in the marine environment in recent times has resulted in considerable pressure being placed on the ocean. This pressure needs to be understood both in the context of sectoral economic activities and its impact on the ocean as a functioning ecosystem. An ecosystem is a functional unit comprising all the organisms in a particular place interacting with one another and with their environment, and interconnected by an ongoing flow of energy and a cycling of materials. Ecosystems may be defined by size. The whole earth may be regarded as one giant ecosystem. On a smaller scale the UNEP has divided the earth's coasts and oceans into 64 Large Marine Ecosystems ("LME"s), of 200 000 km² or greater. These LMEs are associated with 95% of the fish and shellfish yield of the world and represent significant ecosystems in terms of biodiversity and physical ocean dynamics

Two of the 64 LMEs identified by UNEP form part of South Africa's mainland ocean environment, namely the Benguela Current LME and the Agulhas Current LME. The Benguela Current LME extends from 27 degrees east longitude to the northern boundary of Angola. It encompasses the total EEZ of Angola and Namibia and part of South Africa's EEZ. As has already been described, this ecosystem is complex and highly variable. The Benguela Current LME, with its distinct bathymetry, hydrography, chemistry and food webs, is one of the most productive marine areas of the world. The high level of primary productivity supports an important global reservoir of biodiversity and biomass of crustaceans, fish, seabirds and marine mammals.^{xxvii}

The Agulhas LME encompasses the continental shelves and coastal waters of mainland states Mozambique and eastern South Africa as well as the archipelagos of the Comoros, Seychelles, Mauritius and Reunion. At the centre of the Agulhas LME is Madagascar. The dominant large scale oceanographic feature of the LME is the Agulhas Current. The coastal zones of both mainland and island states are characterised by a high faunal and floral diversity. At least 12 of the 38 marine and coastal habitats recognised as distinct by UNEP are found in this LME. ^{xxv/ii}



South Africa's ocean environmental management policy aims to achieve sustainable development of South Africa's marine environment by focussing effort on methods which contribute to Habitat and Biodiversity Conservation; Marine Ecosystem Conservation; and Earth System Conservation:

- The effective coordination, management and regulation of human activities impacting on marine habitat and species will directly contribute towards the sustainability of marine ecosystem functioning.
- The effective coordination, management and regulation of human activities impacting on marine ecosystems will directly contribute towards the improvement of the contribution of marine ecosystem services to the earth system itself.

The value of this approach to ocean management is supported by the findings of the Millennium Ecosystem Assessment which analysed the state of the earth's ecosystems and provided summaries and guidelines for decision

makers. Key findings and recommendations relevant to the South African ocean environmental management policy include: ^{xxx}

- Biodiversity benefits people through more than just its contribution to material welfare and livelihoods. Biodiversity contributes to security, resiliency, social relations, health, and freedom of choices and actions.
- Changes in biodiversity due to human activities were more rapid in the past 50 years than at any time in human
 history, and the drivers of change that cause biodiversity loss and lead to changes in ecosystem services are either
 steady, show no evidence of declining over time, or are increasing in intensity.
- Many people have benefited over the last century from the conversion of natural ecosystems to human dominated ecosystems and from the exploitation of biodiversity. However, these gains have been achieved at growing costs in the form of losses in biodiversity, degradation of many ecosystem services, and the exacerbation of poverty for other groups of people.
- The most important direct drivers of biodiversity loss and ecosystem service changes are habitat change, climate change, invasive alien species, overexploitation, and pollution.
- Improved valuation techniques and information on ecosystem services demonstrate that although many
 individuals benefit from biodiversity loss and ecosystem change, the costs borne by society of such changes are
 often higher.
- To achieve greater progress toward biodiversity conservation to improve human well being and reduce poverty, it
 will be necessary to strengthen response options that are designed with the conservation and sustainable use of
 biodiversity and ecosystem services as the primary goal.
- Short term goals and targets are not sufficient for the conservation and sustainable use of biodiversity and
 ecosystems. Given the characteristic response times for political, socioeconomic, and ecological systems, longer
 term goals and targets are needed to guide policy and actions.
- Improved capability to predict the consequences of changes in drivers for biodiversity, ecosystem functioning, and ecosystem services, together with improved measures of biodiversity, would aid decision making at all levels.
- Science can help ensure that decisions are made with the best available information, but ultimately the future of biodiversity will be determined by society.

An ecosystem based approach to ocean management will of necessity need to take into account existing marine resources use, potential future narine resources use, sectoral use conflicts and current management approaches. The policy therefore needs to consider typical human use pressures which have a potential impact on habitat and biodiversity conservation in South Africa's marine environment. It further needs to take into account how ocean interactions at local and planetary scales impact on human livelihood in order to improve planning and adaptation responses.

c. OCEAN ECOSYSTEM SERVICES

Historically ocean benefits were narrowly defined in categories that linked uses with direct exploitation such as fishing or shipping. More recently the benefits from the environment, including oceans, have been categorised to include broader concepts of ecosystem and earth system functions. Earth system functions include those ecosystem level processes that contribute to the wellbeing of humans and the planet. Beneficial ecosystem functions are called ecosystem services and the ocean accounts for about two thirds of the value of ecosystem services on a global basis. Ecosystem services can be broadly divided into provisioning, cultural, supporting and regulating services. Ecosystems are important for coastal and ocean management.



Diagram: Schematic representation of ecosystem services identified by UNEP xxxii

Ocean management provides a balance between maintaining productivity of the ecosystem and optimising the yield of marine resources. Considerable scientific effort has demonstrated that unbridled economic use of marine resources can have significant impact on the functioning of ecosystems. The protection of ecosystems has emerged as crucial for the promotion of human wellbeing. It is therefore necessary to consider current and predicted human marine resource use in South Africa's ocean.

d. EXISTING OCEAN RESOURCE USAGE

Historically the two prevalent human uses of South Africa's ocean environment have been the harvesting of marine living resources and marine transport. The Southern Cape coast contains archaeological remains such as shell middens, rock art and fish traps, which demonstrate clearly that marine resources have been exploited for a long time. Important archaeological sites such as Klasies Cave and Pinnacle Point have achieved international renown. Shell middens have provided evidence that shell fish formed part of the diet of our early ancestors and some scholars believe that shells were used as early forms of ornamentation. Many fish traps (vywers) are still to be found along the Southern Cape inter tidal zone. Traditional fish traps are also actively used by coastal communities along the Northern KZN coast.

The importance of the ocean adjacent to South Africa as a marine transport route has been demonstrated from as early as the fifteenth century by the Portuguese voyages of exploration. There is also some evidence of Arab and Chinese seafaring traders to the region that pre dates this. Attempts were made to establish a trade route between Europe and the Indies. The eventual establishment of this trade route underpinned the European colonisation of South Africa. Until the opening of the Suez Canal in 1869, the most viable sea route between Europe and the markets and colonies of the East was the ocean of Southern Africa. The significance of this route is demonstrated by the more than 2 700 identified historical ship wrecks off the coast. These wrecks include vessels from 37 different nations.

The 20th century saw an exponential growth in both the intensity and range of exploitation of the marine environment. While the consumption of marine living resources and marine transport remain significant modern uses of the ocean environment, other new uses have emerged. These include the extraction of minerals, oil and gas, eco tourism, increased deep water fishing and innovative methods of energy production. Coastal states like South Africa increasingly have economies which are almost completely dependent on accessing import and export sea trade routes.

Harvesting of Ocean Living Resources

The South African fishing industry is well established and is a net exporter of fishery products. Most of South Africa's fisheries are considered to be fully utilised and high value fisheries such as abalone, rock lobster and line fish are seen as overexploited. South Africa's commercial fishery industry directly employs approximately 20 000 people and harvests in excess of 600 000 tonnes of fish annually. The catch usually varies between 600 000 and 800 000 tonnes per year. The industry has an annual turnover of about 80 billion rand and contributes 0.5% to the South African gross domestic product ("GDP"). Given the current status of wild fisheries stocks, South Africa has identified aquaculture as an area which could provide significant potential for economic growth. It is estimated that aquaculture production could increase from the current 3 543 tonnes (worth R218 million) to more than 90 000 tonnes (worth R2.4 billion) over the next ten to twenty years.^{Xoolii} Currently there are 2 601 rights holders targeting 21 different fisheries using 1 788 vessels.^{Xoodiv}

South African commercial and recreational fishers are reported to catch over 250 marine species, although fewer than 5% of these are actively commercially targeted. The targeted species comprise approximately 90% of the total commercial catch. The pelagic purse seine fishery, seeking predominantly sardine and anchovy, supplies the greatest tonnage of fish landed per annum (538 000 tonnes in 2002).^{xow}



Map: Total trawl (inshore and offshore) effort distribution around the South African coast XXXVI

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The deep sea hake fishery lands the highest value catch, contributing 44% to the total revenue of South African fisheries. In the 1960s, the demersal trawl fishery contributed as much as 90% of South Africa's overall fish landings by value. The hake catches have significantly declined from landings of over 300 000 tonnes to just over 150 000 tonnes annually. This lower level of catch has shown no sign of increase over the last ten years.

The west coast rock lobster (crayfish) fishery of South Africa is considered to be one of the oldest fisheries of the country, dating back to at least 1875 when the first commercial processing plant was established. The annual commercial landings of rock lobster have decreased since the 1960s, indicating that the high landings during earlier years were not sustainable. The 2011/2012 total allowable catch ("TAC") is 2 260 tonnes. Currently the South African harvestable rock lobster biomass is estimated to be approximately 5% of pre exploitation levels and the spawning biomass approximately 20% of pre exploitation levels.

The abalone (perlemoen) resource is presently facing a severe crisis and management measures have been implemented in an attempt to prevent the targeted species from becoming commercially extinct. The abalone fishery is an example of a resource crisis that is significantly impacted by poaching. In an attempt to address this crisis, the commercial abalone fishery has been faced with significant TAC reductions from 500 tonnes in 1999/2000 to 237 tonnes in 2004/2005. The 2011/2012 TAC is 150 tonnes.

Aquaculture of marine species commenced in the 1950s and has continued to grow within South Africa, with the successful farming of the introduced alien black mussel in Saldanha Bay, oysters in Knysna and abalone along the West Coast. Aquaculture permits have also been issued for prawns and seaweeds. Research indicates that certain fin fish species (e.g. salmon and dusky kob,) are ideal candidates for successful aquaculture ventures and experimental farming of Norwegian salmon and turbot has been undertaken.

There is evidence that shows that early fishing effort targeted the most accessible, appealing and plentiful species, without having due regard to a particular species' resilience and role in the food web. Initially pressure was directed at higher levels of the food web and resulted in the depletion of certain predators. Fishery effort was then redirected to lower levels of the food web, which included prey species. The continuation of this cycle has had the unintended consequence that global human fishing effort has impacted on higher and lower levels of the food web and resulted. ^{xxodx}

Ocean Transport

An estimated 7 000 vessels pass around South Africa's coastline annually, of which many are laden tankers carrying in excess of 30 million tonnes of crude oil. Additionally over 9 000 ships visit South Africa's ports annually. 98% of South Africa's exports are conveyed by sea. The turnover from South Africa's harbour activities in the 2009/10 financial year was R12.6 billion. South Africa recently acquired and installed 19 new container handling cranes in its ports. South Africa's commercial ports handle over 430 million tonnes of varied cargo types each year. Richard's Bay is South Africa's largest cargo volume port handling in excess of 80 million tonnes of cargo annually. Durban is South Africa's largest port in terms of value of cargo handled as well as the number of vessels docking per year.^{Al} Container traffic is predominantly routed through Durban, with 2.5 million twenty foot equivalent units ("TEUs") passing through the port. Cape Town moved just below 700 000 TEUs and Port Elizabeth almost 400 000 TEUs in the 2008/09 financial year. During the early 1990s the South African merchant marine register was composed of about 120 ships. However, by 2010, the South African Maritime Safety Authority ("SAMSA") marine register recorded no South African flag vessels.

Cargo/Commodity Description 2008/9 ACTUAL TONNAGE		DURBAN	EAST	MOSSEL BAY	POILT	SALDANHA	RICHARDS	CAPE	ALL PORTS
Dry B	uik Handled per commodity:				r:				
15	WHEAT & PRODUCTS THEREOF	1,053,918	70,960					112,720	1,237,598
18	AGRIC PROD/SEAWEED NOT SPECIFIED	775,733	34,615					286,630	1,096,978
37	MANGANESEORE	727,269			2,721,997		1,005,888		4,455,172
38	IRON ORE	÷				32,975,052			32,975,052
39	CHROME ORI	1.2					1.268,389		1,268,389
41	SULPHUR						838.985		838,988
46	ALUMINA	40,239					1,534,085		1,574,324
47	TITANIUM SIAG	-					774,135		774,136
62	FERTILZER & PRODUCTS THEREOF	726,361						218,055	944,415
68	WOOD CHIPS	544,640			14,774		2,473,508		3,032,922
94	COAL	1,575,365				85,606	66,075,421		67,736,192
TOTAL DRY BULK HANDLED:		7,719,993	425,076	14	2,736,771	33,591,374	74,747,008	807,223	120,027,445
Liquid	Bulk PetroleumHandled:								
61	PETROL AND PETROLEUM GAS	24,421,625	870,857	1,781,660	1,011,321	15,714,073	259,978	1,744,595	45,804,109
TOTA	LUQUID BULK PETROLEUM HANDLED:	24,421,625	870,857	1,781,660	1,011,321	15,714,073	259,978	1,744,595	45,804,109
Other	Liquid Bulk Hamfled per Commodity (Excl. Petroleum):								
26	ANIMAL/VEGET OIL/FATS &PROD THEREOF	727,123						46,752	773,875
64	ACIDS	3,354					013,384		616,738
66	CHEM & PRODUCTS THEREOF NOT SPEC.	1.117.009					828.597	1.017.881	2,963,487
TOTA	L OTHER LIQUID BULK HANDLED:	2,059,766			1.	100 N 100	1,592,044	1,079,329	6,661,073
Break	bulkVehicles Handled:							1000	1
88	VEHICLES ON OWN WHEELS (RO-RO ONLY)	3,594,636	511,632		70,195			-	4,176,467
TOTA	L VEHICLES HANDLED:	3,594,636	511,632	2-	70,199	2		-	4,176,467
Break	bulk Handled per Commodity (Excl. Vehicles)								
6 :	CITRUS FRUIT	316,647			97,721			74,805	489,178
40	GRANITE & PRODUCTS THEREOF	51,227				17,505	320,300		389,032
67	WOODPULP	219,871						_	219,871
80	FERRO ALLO'IS	3,005					2,090,301		2,093,306
82	STEEL & PRODUCTS THEREOF	1,029,285	31,298		108,958	573,353	416,822	24,070	2,183,785
TOTAL BREAKBULK HANDLED:		2,267,352	125,683	70,261	106,846	977,317	3,749,300	327,244	9,915,480
TOTAL TEUS HANDLED:		2,560,450	56,767	0	398,747	0	0	694,737	3,710,661

Table: Key Commodities Throughputs across the South African Port System 2008/09 xii

Ocean Mining

In 1908 diamonds were discovered along the southern Namibian coast. In 1925 diamonds were discovered near Port Nolloth. In 1926 rich deposits were discovered near Alexander Bay and the then South African government commenced mining operations along this coast. In the early 1950s prospecting for off shore diamonds commenced. Today off shore mining of diamonds along the South African West Coast is an important industry. In 1997, alluvial and marine diamonds comprised approximately 10% of South Africa's total diamond yield with marine diamonds specifically comprising 0.35% (nearly U\$6 million). Marine diamond mining contributes 0.0026% to South Africa's annual GDP. ^{xlii} In 1994, the then South African Department of Minerals and Energy established a grid network of marine mineral concession zones on the West Coast of South Africa (from the Orange River mouth to just south of Saldanha Bay, extending from the high water mark seawards to 500 m depth.

Internationally the off shore exploration for hard minerals is on the increase and it is to be expected that the exploitation of South Africa's non living marine resources will also increase. Deposits of two minerals important for the production of fertiliser (potassium and glauconite) are widely found in South Africa's EEZ. Currently the costs of extraction remain prohibitive in the context of similar terrestrial resources. However, as terrestrial resources diminish and technology improves these deposits may become economically viable.



Ocean Fossil Fuels

The Geological Survey of South Africa conducted the first organised search for fossil fuels in South Africa in the 1940s. Initially all searches were land based. The first off shore well was drilled in 1969 and gas and condensate was discovered in the Pletmos basin (between Plettenberg Bay and Mossel Bay). Currently the Pletmos basin contains two undeveloped gas fields and a further six gas discoveries. The Bredasdorp basin has been the focus of most seismic and drilling activity since 1980. The South African part of the Orange bank and shelf also contain oil and gas deposits that

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