

MARINE POLLUTION IN THE AGULHAS & SOMALI CURRENTS LARGE MARINE ECOSYSTEM

Report prepared for David Vousden: Project Director: ASCLME Project

by

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Executive summary

Deteriorating quality of the coastal waters of the ASCLME region poses a significant threat to public health as well as to the health of its living marine resources and ecosystems – and thus also to the economy to which fisheries revenues, for example, contribute US\$943 million annually (ASCLME). The sources of pollution which contribute to this deterioration include both land-based and marine and maritime related activities. Since Land-Based Activities were the focus of the WIO-LaB project, the focus of this review was on marine sources which include dumping, shipping, ports, and oil and gas activities. While globally Land-Based Activities are considered to contribute between 80 – 90% of the pollution load to the marine environment, marine sources can make significant contributions to localised and trans-boundary pollution.

The successful management of marine pollution requires an effective legal regime covering national, regional and international levels. Although the majority of ASCLME countries are Party to most of the relevant international conventions – and are all members of the Nairobi Convention - there are a number of gaps and inconsistencies especially in their national legal and institutional frameworks which need to be addressed. For example:

- There are many cases of overlapping jurisdictions, and a lack of communication across sectors;
- Failure to domesticate the provisions of international conventions even when they have been ratified;
- Even where legislation is in place, the implementation is weak due to a lack of adequate financial, technical and human resources;
- Surveillance activities are split amongst various institutions – this is neither cost-effective nor efficient;
- Maritime borders between some of the countries have not yet been agreed and with the increasing interest in offshore resources, could lead to conflicts.

There is also a need to introduce and/or strengthen legislation on dredging – especially dredged material disposal – the environmental impacts of offshore oil and gas activities, liability and compensation related to offshore activities, and monitoring and standards.

At the regional level, additional Technical Protocols should be developed under the Nairobi Convention to “operationalise” the relevant articles and promote regional harmonisation in the management of marine pollution. These could include:

- A Protocol on dredging/dumping; and
- A Protocol on the management of pollution from offshore activities (this could be broadened to cover all environmental impacts rather than just pollution) and including discharge standards.

These could be supported by the development of a Regional Policy on Marine Pollution and a Regional Code of Practice for Environmental Management in Ports be developed in collaboration with PENAF and PMAESA. Consideration should also be given to the establishment of Special Areas and or Particularly Sensitive Sea Areas under MARPOL in the region.

With respect to international conventions, efforts should be made to promote the ratification of Annexes IV (sewage) and V (garbage) of MARPOL, as well as the Anti-fouling Convention (2001) and the London Protocol (1996).

From a technical perspective, there is a lack of detailed information available on marine sources in most countries due, at least in part, to the fact that the sources are not being adequately managed either because there is limited or no legislation or there is a lack of technical capacity – or both.

While there is a limited amount of dumping (as defined in the London Convention/Protocol) taking place in the region it is highly likely that ports in all countries undertake dredging on a reasonably regular basis and that many of them are dumping the dredged material at sea. Moreover, although four of the countries are Party to the London Convention/Protocol, most of them do not appear to be implementing it. In addition, there have been persistent reports of illegal dumping of toxic wastes off of the coast of Somalia. These represent a threat to the region as a whole.

There is minimal information on shipping incidents and the associated pollution – although there is information on incidents involving piracy. Information on shipping traffic is outdated, although it can be inferred from the port expansion plans that shipping activity in the region is increasing. Similarly, there is limited or no direct information on pollution in ports for most countries, although it is significant that the majority of the pollution hotspots identified by the WIO-LaB project are in or adjacent to ports. Efforts should be made to improve record-keeping and reporting for shipping and port activities.

Offshore oil and gas activities are expanding in most of the countries in the region and although there do not appear to have been any major pollution incidents to date, the risk of spills is increasing. Moreover, the growing number of platforms in the area increases the potential for conflicts with fisheries interests, not only due to pollution but as a consequence of habitat degradation and physical exclusion from drilling areas and abandoned rigs. At the same time, it is likely that the capacity to manage these activities is limited and since many of the companies involved are international, there may be problems of accountability.

Despite the general lack of data, the types of pollutant from marine sources likely to be of particular concern include:

- Litter from vessels, offshore rigs and port activities;
- Petroleum hydrocarbons from shipping, port operations and offshore oil and gas activities (including accidental and operational discharges);
- Tributyltins (TBT's) and other toxic constituents from anti-fouling coatings on vessels and submerged infrastructure;
- Heavy metals and other toxic contaminants (eg. pesticide residues) which accumulate in, for example, port sediments and which may then be discharged into other coastal areas after dredging operations;
- Noise pollution associated with seismic surveys used in oil and gas exploration;
- Suspended solids, accumulated deposits, antibiotics, heavy metals and other toxic constituents associated with the drilling muds used and/or produced water arising from offshore oil and gas exploitation;
- Microbiological pollutants and organic matter arising from sewage and garbage discharges from vessels and drilling rigs/platforms, particularly if they are located in shallow water and/or semi-enclosed areas where water circulation is limited.

There is therefore, in addition to the legal and institutional reforms, a need to introduce and/or enhance the management of all marine sources of pollution through:

- setting of standards as appropriate;
- implementing monitoring and assessment programmes;
- development of environmental management plans (for example, for ports, offshore rigs etc);
- development of Codes of Practice (for example, for ports);
- the provision of technical training, particularly for governmental officials.

Much of this can be achieved through collaboration with existing programmes and organisational partners already active in the region. The Office of the London Convention/Protocol and PENAf, for example, have already expressed a strong interest in a number of the proposed activities.

1. Background and Introduction

As described in the Project Document (2008): *“The Agulhas Current Large Marine Ecosystem (ACLME) stretches from the northern end of the Mozambique Channel to Cape Agulhas and is characterised by the swift, warm Agulhas current, a western boundary current that forms part of the anticyclonic Indian Ocean gyre. The Somali Current Large Marine Ecosystem (SCLME) extends from the Comoros Islands and the northern tip of Madagascar up to the Horn of Africa. It is characterised by the monsoon-dominated Somali current, which has a strong, northerly flow during the summer, but reverses its flow in the winter. These two LMEs are both complex and interactive, and are strongly influenced by the South Equatorial Current, which is funnelled across the Mascarene Plateau east of Madagascar before diverging north and south to become components of the Agulhas and Somali Currents. The LMEs are primarily defined by their bathymetry, hydrography, productivity and biota. They are characterized by a dynamic system of ocean currents and upwelling cells, which regulate climate and influence weather patterns, sea temperatures, water chemistry, productivity, biodiversity and fisheries. They also represent an important repository of living marine resources, which underpin the livelihoods of coastal communities in 10 countries and territories.*

Biodiversity-wise, the area is considered to be a distinct biogeographical province within the larger Indo-West Pacific region with high levels of regional endemism and a high diversity of marine life, from phytoplankton and zooplankton that drive important commercial and artisanal fisheries, to charismatic and endangered species such as the Coelacanth, dugong, turtles, and many species of cetaceans. Habitat alteration, pollution, overexploitation of biological resources, and the adverse effects of environmental variability represent the main threats to the ecosystems. Environmental variability within the LMEs includes variations in surface seawater temperature, seasonal changes in temperature gradients across the Indian Ocean, and the El Niño Southern Oscillation (ENSO). This variability is a particular concern as it threatens the sustainability of coastal livelihoods, is altering critical habitats and their species compositions (e.g. coral reefs), and is hampering long-term management planning efforts.

Although the processes and ecosystem functions related to these two LMEs have a major influence on the societies and economies of the area, very little detailed information is available upon which to base effective, cooperative transboundary management initiatives. The management of marine resources is currently sectoral and country-based. The main barriers to the development of an ecosystem approach to transboundary management include inadequate data, lack of regionally based and coordinated monitoring and information systems, lack of national and regional capacity, and the absence of full stakeholder involvement. It is impossible, under this situation for governments to manage fisheries and other marine resources in the absence of an understanding of the ocean-atmosphere, trophic and biogeochemical dynamics that characterise the LMEs. “

1.1 The ASCLME Project

The Agulhas and Somali Currents Large Marine Ecosystem (ASCLME) Project is part of a multi-project, multi-agency programme which also includes the WIO-Lab project implemented through UNEP and which addresses land-based sources of marine pollution (Phase I now complete); and SWIOFP which is being implemented

through the World Bank with the objective of building knowledge for the purposes of managing industrial fisheries.

The objective of the ASCLME project is to “*institutionalize cooperative and adaptive management of the LME.*” More specific objectives are to:

- build the knowledge base and strengthen technical and management capabilities at the regional scale to address transboundary environmental concerns within the Agulhas and Somali LMEs;
- build political will to undertake threat abatement activities; and
- leverage finances proportionate to management needs.

The activities within the ASCLME Project – together with WIO-Lab and SWIOFP - are focused on filling the significant coastal and offshore data and information gaps for these LMEs with a view to producing national Marine Ecosystem Diagnostic Analyses (MEDAs) that feed into a Transboundary Diagnostic Analysis (TDA) and a Strategic Action Programme (SAP) for the region. Amongst others, they will identify areas where policy, legal, and/or institutional reforms and investments are needed to address transboundary priorities. In addition, the projects will build capacities at regional level for the management of the LMEs.

1.2 Terms of Reference and Deliverables

The principal purpose of this report is to consolidate and synthesise information on marine pollutants for the ASCLME Marine Ecosystem Diagnostic Analysis, Transboundary Diagnostic Analysis and Strategic Action Plan. The work includes:

- A desk top study of relevant activities and information available to support MEDA/TDA/SAP development, including:
 - A review of the institutional arrangements, scope (geographic scope, parameters recorded and periodicity) and activities of current monitoring programmes for marine pollution;
 - A review and summary of national and international disaster management and contingency plans for marine pollution;
 - A review of current national and international institutional arrangements, policy and legal provisions relevant to marine pollution;
 - An updated inventory of the offshore oil and gas developments;
 - An updated inventory of shipping traffic;
 - An updated list of major oil spills in the region;
 - A review of dumping activities in the region.
- The development of recommendations for the integration of the marine pollution components of the ASCLME long term ecosystem monitoring programme with those of other programmes and agencies;
- The development of proposals/ guidelines for legal, policy and institutional reform at the regional and national level;
- The facilitation of communication, data exchange, harmonisation and/or integration of activities (where appropriate) between the ASCLME Project, the International Maritime Organisation (IMO), the International Ocean Institute (IOI) and other programmes active in the region, including the GEF-WIO Marine Highway Development and Coastal and Marine Contamination Prevention Project and the Ports Environmental Networks Africa (PENAf).

2. Marine Pollution: The Regulatory Framework

The most widely recognised definition of marine pollution is that which was developed by GESAMP (The Joint Group of Experts on the Scientific Aspects of Marine Pollution): a United Nations inter-agency body which was established in 1969 to advise the IMO, the FAO, UNESCO, the IAEA, the WHO, WMO and UNEP. The GESAMP definition of marine pollution is:

Pollution means the introduction by man, directly or indirectly, of substances or energy into the marine environment (including estuaries) resulting in such deleterious effects as harm to living resources, hazards to human health, hindrance to marine activities including fishing, impairment of quality for use of seawater and reduction of amenities.

There are four main sources of marine pollution:

- Land-based Sources
- Dumping
- Maritime Transport
- Offshore prospecting and mining activities.

For historical and other reasons, these sources tend to be regulated separately – at international and national levels - as discussed in the various sections below.

2.1 International Governance of Marine Pollution

At the international level marine pollution is regulated through both formal agreements in the form of international conventions and treaties, as well as “soft law” such as declarations, resolutions or guidelines adopted at international meetings, and/or through international programmes. These are generally implemented through relevant specialized agencies of the United Nations such as the United Nations Division of Ocean Affairs and Law of the Sea (UNDOALOS) at UN Headquarters in New York, the International Maritime Organisation (IMO), based in London, which is responsible for the regulation of international shipping and navigation activities, and the United Nations Environment Programme (UNEP), headquartered in Nairobi which deals with environmental issues in general.

2.1.1 International Conventions and Institutions

2.1.1.1 *UNDOALOS and the UN Convention on the Law of the Sea (UNCLOS)*

UNDOALOS is the main UN agency responsible for administering global ocean and marine affairs generally including the UNCLOS (1982). The Convention provides a comprehensive regime for regulation of the world's oceans and seas establishing rules governing all uses of the oceans and their resources. Section 5 of UNCLOS is dedicated specifically to prevention of pollution of the marine environment through, amongst others, the following general and specific Articles:

- Article 192: ‘States have the obligation to preserve and protect the marine environment’;
- Article 194 (1): States agree to take the necessary measures to prevent and control pollution of the marine environment from any source using the best practical means at their disposal;

- Article 207 (1): ‘States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment from land-based sources, including rivers, estuaries, pipelines and outfall structures, taking into account internationally agreed rules, standards and recommended practices and procedures’;
- Article 208 (1): ‘Coastal States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment arising from or in connection with sea-bed activities subject to their jurisdiction and from artificial islands, installations and structures under their jurisdiction, pursuant to articles 60 and 80.
- Article 210 (1): States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment by dumping;
- Article 211 (1): ‘States, acting through the competent international organisation or general diplomatic conference, shall establish international rules and standards to prevent, reduce and control pollution of the marine environment from vessels and promote the adoption, in the same manner, wherever appropriate, of routing systems designed to minimise the threat of accidents which might cause pollution of the marine environment, including the coastline, and pollution damage to the related interests of coastal States .

Section 6 deals with the enforcement of these laws by coastal, port and/or flag states (Arts 213 to 220) and the right of coastal states to intervene in order to avoid pollution from maritime casualties (Article 221).

All the ASCLME countries have ratified UNCLOS as shown in Table 1 below, and therefore have an obligation to regulate all sources of marine pollution.

Table 1: Date of ratification of UNCLOS

Country	Date of Ratification
Comoros	21.6.1994
Kenya	2.3.1989
Madagascar	22.8.2001
Mauritius	4.11.1994
Mozambique	13.3.1997
Seychelles	16.9.1991
Somalia	24.7.1989
South Africa	23.12.1997
Tanzania	30.9.1985

2.1.1.2 The IMO Conventions

Oil pollution from ships was one of the earliest recognised forms of marine pollution, and as a result of the many ships lost during the Second World War, was also the first for which an international Convention was adopted – namely OILPOL, 1954. However, shipping is also a significant source of other forms of marine pollution, both as a consequence of routine operational discharges as well as from shipping accidents which can result in the spillage not only of fuel, but also whatever cargo the vessel is carrying. OILPOL has therefore now been replaced by MARPOL 1973/78 – the International Convention for the Prevention of Pollution from Ships – and other conventions. These are all administered by the IMO.

MARPOL regulates deliberate operational discharges from ships at sea and contains detailed rules and standards set out in six technical annexes as follows:

- Annex 1: Oil pollution
- Annex 2: Noxious liquid substances in bulk
- Annex 3: Harmful substances in packaged form
- Annex 4: Sewage from ships
- Annex 5: Garbage
- Annex 6: Air Pollution

These Annexes introduce mandatory anti-pollution measures into the design, equipment and operational procedures of ships. Flag states are then required to ensure that ships under their jurisdiction meet these measures, with compliance being monitored through Port State Control. Contracting Parties are obliged to comply with Annexes I and II, but may be selective with regards the other Annexes.

In addition to MARPOL, there is a convention which regulates the use of anti-fouling paints on vessels - the International Convention on the Control of Harmful Anti-fouling Systems on Ships. This was adopted in October 2001 and came into force on 17 December 2008. The initial objective of this was a prohibition on the use of organotins (TBT's) in anti-fouling paints by January, 2008, but it also established a mechanism to control the use of other toxic compounds for anti-fouling purposes.

There are also a number of IMO Conventions dealing with pollution emanating from shipping accidents. These include:

- The International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969 (Intervention Convention) which allows coastal states to take measures on the high seas that are necessary to prevent, mitigate or eliminate grave or threatened danger to their coastline from pollution or threat of pollution from oil as a result of a maritime casualty.
- The Protocol relating to Intervention on the High Seas in Cases of Marine Pollution by Substances other than Oil of 1973. It contains similar provisions to the Intervention Convention, but applies to substances other than oil as listed in the Protocol.
- The International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 (OPRC Convention) which requires parties to prepare oil pollution reporting procedures; national and regional systems for preparedness and response and related matters. It applies not only to ships but also to 'offshore units' and 'sea ports and oil handling facilities' and requires ships flying the flag of a contracting state, as well as offshore units and ports, to have oil pollution emergency plans.
- The International Convention on Civil Liability for Oil Pollution Damage 1992 (CLC) was originally adopted in 1969 (CLC 1969) but has been subsequently amended by three Protocols so it is now known as CLC 1992. It establishes a system for victims of oil pollution damage to obtain compensation from the owners of vessels which caused the harm by imposing strict liability for oil pollution damage.
- The International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances at Sea, 1996 (HNS Convention) imposes liability on the owner of a ship for damage caused as a result of any incident in connection with the carriage of materials and noxious substances on board a ship.
- The International Convention on the Establishment of an International Fund for Oil Pollution Damage 1992 (FUND Convention) - originally established in 1971

but subsequently amended - provides additional compensation for victims of oil pollution as well as for pollution damage where there is inadequate compensation under the CLC.

Apart from the Conventions directly related to pollution, there are numerous other conventions which deal with the safety aspects of shipping and which therefore also contribute to reducing shipping accidents and associated pollution. These are, however, not dealt with here.

All the ASCLME countries are signatories to the IMO Convention (1948) itself, and are thus members of the IMO. Their status with respect to the other IMO Conventions is summarised in Table 2 below.

Table 2: ASCLME countries signatory to IMO Conventions

Convention	Country								
	Com	Kenya	Mad	Maur	Moz	Sey	Som	RSA	Tanz
MARPOL 73/78 (Ann I/II)	X	X	X	X	X	X		X	X
MARPOL Annex III	X	X	X	X	X			X	X
MARPOL Annex IV	X	X	X	X	X				X
MARPOL Annex V	X	X	X	X	X			X	X
MARPOL Annex VI									
Intervention Convention 69				X				X	X
Intervention Protocol 73				X				X	X
CLC Protocol 92	X	X	X	X	X	X		X	X
FUND Convention 71		D		D	D	D			
FUND Protocol 92	X	X	X	X	X	X		X	X
FUND Protocol 2003									
OPRC 1990	X	X	X	X	X	X			X
HNS Convention 96									
OPRC/HNS 2000									
Anti-fouling Convention 01									

Note: X = Party, D = denunciation.

2.1.1.3 The London Convention (1972) and 1996 Protocol

The "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972", commonly known as the "London Convention", defines dumping as the deliberate disposal of wastes from ships and aircraft, including incineration at sea, but excludes the disposal of waste from the normal operation of ships and aircraft (which is covered by MARPOL, as seen above). It came into force in 1975 and established a system to regulate dumping by categorising wastes as prohibited (Black List), wastes to be dumped under a Special Permit (Grey List) and wastes which could be dumped under a general permit.

Over the years changes to the provisions of the Convention were adopted by a number of Resolutions of the Contracting Parties – for example, the phasing out of sea disposal of industrial waste - and it was eventually agreed to completely modernise the Convention. This is being effected through the "London Protocol" which was adopted in 1996, came into force in March, 2006 and will replace the Convention once it has been adopted by all members of the Convention. Since this has not yet happened, there is currently a dual regime in place.

Under the Protocol all dumping is prohibited, provided that wastes on the so-called "reverse list" may be considered for dumping subject to a set waste assessment procedure. The reverse list includes:

- Dredged material
- Sewage sludge
- Fish waste, or material resulting from industrial fish processing operations
- Vessels and platforms or other man-made structures at sea
- Inert, inorganic geological material
- Organic material of natural origin
- Bulky items primarily comprising iron, steel, concrete and similar harmless materials, for which the concern is physical impact, and limited to those circumstances where such wastes are generated at locations, such as small islands with isolated communities, having no practicable access to disposal options other than dumping.
- Carbon dioxide streams from carbon dioxide capture processes for sequestration.

The 1996 Protocol also expands the definition of dumping to include the storage of wastes in the seabed and subsoil thereof, and the abandonment or toppling of platforms or other man-made structures on site (and at sea) for disposal purposes. It also prohibits incineration at sea.

The London Convention and Protocol are administered by a Secretariat which is based at the IMO although this is not strictly an IMO convention.

Four of the ASCLME countries are Contracting Parties to the Convention, of which two have also ratified or acceded to the Protocol as shown in Table 3 below.

Table 3: ASCLME countries which are Contracting Parties to the London Convention/Protocol.

Country	Date of ratification of London Convention	Date of ratification of London Protocol
Kenya	7 January 1976	14 January 2008
Seychelles	29 October 1984	N/A
South Africa	7 August 1978	23 December 1998
Tanzania	28 July 2008	N/A

2.1.1.4 Offshore Activities

Although there is no specific International Convention dealing with pollution arising from offshore exploration and exploitation activities, the UNCLOS and MARPOL deal with them to some extent. In addition to the more general articles (see above), Article 208 of UNCLOS states:

- “1. Coastal States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment arising from or in connection with seabed activities subject to their jurisdiction and from artificial islands, installations and structures under their jurisdiction, pursuant to articles 60 and 80.*
- 2. States shall take other measures as may be necessary to prevent, reduce and control such pollution.*
- 3. Such laws, regulations and measures shall be no less effective than international rules, standards and recommended practices and procedures.*
- 4. States shall endeavour to harmonize their policies in this connection at the appropriate regional level.*
- 5. States, acting especially through competent international organizations or diplomatic conference, shall establish global and regional rules, standards and recommended practices and procedures to prevent, reduce and control pollution of the marine environment referred to in paragraph 1. Such rules, standards and recommended practices and procedures shall be re-examined from time to time as necessary.”*

As far as MARPOL is concerned, Regulation 21 of Annex I, for example, specifically provides that fixed and floating rigs, when engaged in the exploration, exploitation and associated offshore processing of sea-bed mineral resources, must comply with the requirements of Annex I applicable to ships of 400 tons gross tonnage and above other than oil tankers.

Similarly, Annex V contains special provisions for the disposal of garbage from fixed or floating platforms engaged in the exploration, exploitation and associated processing of seabed mineral resources which are actually stricter than those for other vessels.

In addition, the UNEP Regional Seas Conventions contain provisions on offshore activities and, in some cases, Technical Protocols. These will be discussed in Section 2.2

2.1.2 Soft Law and Marine Pollution

Typical examples of ‘soft law’ include international declarations or statements of principles made by governments at international gatherings (eg 1992 Rio Declaration on Environment and Development) and international guidelines (eg Guidelines on the Dumping of Wastes and Other Matter formulated under the London Convention). They are important in as much as the principles often subsequently become incorporated into new treaties or conventions, while guidelines which are initially voluntary can become binding if they are adopted by Resolution by the Conference of Parties (COP) of a Convention. They may also lead to the development of programmes which promote the implementation of the principles.

Of particular importance in the context of marine pollution, since it is not covered by an international convention, is the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (the GPA), which was initiated in

response to a call in Agenda 21 – the programme which was adopted at the 1992 Rio Summit.

2.1.2.1 The Global Programme of Action on Land-based Activities

The Global Programme of Action on Land-based Activities (GPA) was adopted in 1995 by 108 countries and the European Commission committing them to prevent the degradation of marine and coastal environments from land-based impacts and threats through long-term, cross-sectoral, multi-disciplinary, and participatory responses. The GPA was subsequently formalised through the Washington Declaration (1995), the Montreal Declaration (2001) and the Beijing Declaration (2006). As signatories to the GPA and various declarations the 108 countries are, therefore, obliged to undertake action that is consistent with the commitments enshrined in these declarations. This includes all of the ASCLME countries with the exception of Somalia.

The GPA is coordinated by the UNEP GPA Office in The Hague (www.gpa.unep.org) and is designed to provide conceptual and practical guidance to national and/or regional authorities for the development and implementation of action programmes to prevent, reduce, control and/or eliminate marine degradation from land-based activities. It aims to facilitate the fulfilment by States of their duty to preserve and protect the marine environment. More specifically, the GPA urges countries to:

- Identify and assess problems in the marine environment as a result of land-based activities;
- Establish priorities for action through the development of National Programmes of Action on Land-based Activities;
- Set management objectives for priority problems for source categories and areas affected on the basis of established priorities;
- Identify, evaluate and select strategies and measures to achieve these objectives; and
- Develop criteria for evaluating the effectiveness of strategies and measures.

The implementation of the GPA, therefore, is primarily the task of Governments, in close partnership with all stakeholders including local communities, public organizations, non-governmental organizations and the private sector. However, the Regional Seas Programme of UNEP has also been identified as an appropriate framework for the delivery of the GPA at the regional level. This will therefore be discussed in more detail in Section 2.2 below.

2.2 Regional Agreements

2.2.1 The Nairobi Convention

Co-operation amongst neighbouring countries is fundamental to effective environmental management because ecosystems and natural resources, and the threats to them, commonly transcend national boundaries and cannot be regulated by individual States alone. This is particularly so in marine environments, and has led to the development of the UNEP Regional Seas Programmes which now cover 17 regions made up of some 140 countries.

The Regional Seas Programmes function through Action Plans underpinned in most cases by a strong legal framework in the form of a regional Convention and associated technical Protocols on specific problems. They thus provide an ideal platform for the implementation of international conventions in addition to regional programmes.

The Regional Seas Programme for the Eastern African Region encompasses five mainland states, namely South Africa, Mozambique, Tanzania, Kenya, and Somalia, as well as five island states, Reunion (France), Comoros, Madagascar Seychelles and Mauritius i.e. all the ASCLME countries. The relevant convention - the Convention for the Protection and Development of the Marine and Coastal Environment of the Eastern African Region, 1985 – is commonly known as the 'Nairobi Convention'. It was adopted by 7 countries at a Conference in Nairobi in June, 1985 and entered into force on 30th May, 1996 after the deposit of the 6th instrument of ratification. It has now been ratified by all 10 countries. An amended version of the Convention was adopted in March, 2010, but has yet to be ratified.

The Convention comprises 21 Articles some of which deal with marine pollution¹:

- Article 2 (b) defines pollution according to the GESAMP definition;
- Article 4 covers general obligations, including those on marine pollution;
- Article 5 deals with pollution from ships;
- Article 6 covers pollution caused by dumping;
- Article 7 deals with land-based sources;
- Article 8 provides for pollution from sea-bed activities;
- Article 9 deals with airborne pollution;
- Article 11 provides for co-operation between Contracting Parties to combat pollution in cases of emergency; and
- Article 15 covers liability and compensation for damage resulting from pollution in the Convention area.

The amended convention also includes an Article on Pollution Resulting from Transboundary Movements of Hazardous Wastes.

The Convention also has a number of technical protocols, two of which are relevant to marine pollution:

- The Protocol concerning Co-operation in Combating Pollution in Cases of Emergency in the Eastern African Region. The objective of this is to facilitate the development of regional arrangements to supplement national arrangements for the effective combating of major spillages of oil and other harmful substances from ships. The provisions cover the development of legislation and contingency plans, exchange of information, reporting of incidents and mutual assistance. This Protocol was adopted along with the Convention in 1985; and
- The Protocol for the Protection of the Marine and Coastal Environment of the Western Indian Ocean from Land Based Sources and Activities. This was adopted in March, 2010 but is yet to be ratified. The objective of the Protocol is to promote collaboration and co-operation amongst Contracting Parties to enhance and strengthen efforts to protect the Western Indian Ocean region from land-based sources and activities.

The Secretariat of the Convention is hosted by the UNEP offices in Nairobi, and has actively supported a number of projects and programmes to further the objectives of the Convention. One of the most recent of these was WIO-LaB project: "Addressing Land Based Activities in the Western Indian Ocean" (www.wiolab.org/) the first phase of which was implemented between 2005 - 2010. The project was a partnership between the countries of the WIO Region, the Norwegian government, UNEP, and

¹ Article numbers reflect those in the text of the original convention.

the GEF and was designed to serve as a demonstration project for the GPA. The key outputs of this project were a Transboundary Diagnostic Analysis and Strategic Action Programme. The SAP forms an integral part of the work programme of the Nairobi Convention. It has four major objectives and is intended to be implemented by 2035. Objective B, for example, states that: “Water quality in the WIO region meets international standards by year 2035”.

Another regional project which is directly relevant in terms of marine pollution in the ASCLME region is the WIO Highway Development and Coastal and Marine Contamination Prevention Project. This is a World Bank-GEF project which is being implemented through the South African Maritime Safety Authority and the Indian Ocean Commission. The project has three primary objectives:

- To ascertain the feasibility of introducing an electronically supported marine highway, system to guide ships through sensitive areas and to encourage monitoring of the movements and activities of fishing and other vessels operating within countries’ territorial waters;
- To widen the existing regional agreement on port state control and promote implementation of its provisions;
- To build capacity for coastal sensitivity mapping and oil spill response in the mainland states - Kenya, Mozambique, South Africa, and Tanzania – with a view to including them in a regional oil spill response plan with the West Indian Ocean island states. This builds on an earlier World Bank project which developed similar capacity in the WIO island states. The project is also supporting the updating of contingency plans and further capacity building in the island states.

2.2.2 Indian Ocean MoU on Port State Control

The Indian Ocean MoU on Port State Control was developed with the objective of creating a harmonized system of ship inspections across the region so as to eliminate the presence of sub-standard ships in the region which, in turn, would reduce the risk of pollution from ships. The MoU was first signed in 1999 and came into effect in April of that year. It is coordinated by a Secretariat based in Goa, India.

Membership of the MoU stretches from Australia to India and South Africa. Other ASCLME countries that have signed it include Kenya, Mauritius, Mozambique, Seychelles and Tanzania. One of the objectives of the WIO Marine Highway Project is to expand this membership to include Comoros and Madagascar.

2.3 National Policy, Legislation and Institutional Arrangements²

While all the ASCLME countries are Party to at least some of the international conventions on marine pollution, this does not necessarily mean that the provisions of those conventions are in force nationally – or that they are being implemented. This is because the relationship between international and domestic law depends on the prevailing national legal system, which varies from country to country.

There are two basic approaches:

- (a) A monist approach in which international law is regarded as being automatically part of domestic law (providing the country has signed it);

² This section focuses on items directly relevant to marine pollution and the sources thereof. More detailed information on the broader regulatory framework can be found in the national and regional reports on Policy and Governance.

and

- (b) A dualist approach which requires the promulgation of an act or other legal procedure by the national legislature to incorporate the international law into the domestic law system. This can take the form of a very simple Act which merely states that the Convention (or other agreement) is applicable in the country concerned (in which case the text of the international law is usually attached as an Annex), or it can be a more complex Act which spells out all of the relevant provisions. This latter approach allows the provisions to be adapted to local circumstances, including the addition of extra provisions, or the merging of provisions from a number of related conventions into a single Act.

The implication though, is that to understand the regulatory framework for marine pollution in a country, it is not sufficient to know which conventions that country is Party to, but that in addition, there must be an analysis of the relevant national legislation. The policy, legislation and institutional arrangements for the management of marine pollution in each of the ASCLME countries are therefore described below to the extent that information was made available.

2.3.1 Comoros

Comoros is a Party to UNCLOS, many of the relevant IMO Conventions - excluding the Intervention Convention - and the Nairobi Convention. The IMO Conventions are implemented through the Maritime Shipping Act 2001. The Act is administered by the Ministry of International Transport although most of the functions have been delegated to the Maritime Administration of the Union of Comoros, headed by the Commissioner for Maritime Affairs. These include ensuring that the country's maritime activities are conducted in accordance with the local and international standards of maritime safety and pollution prevention.

Comoros also has a law on the delimitation of maritime zones, and a decree which establishes a national office for ports. However, the 9 ports - including Mamoudzou, Pamanzi Bay, Fombouni, Longoni, Mutsamudu, Moroni, Dzaoudzi, and Mayotte - appear to have separate Port Authorities, and the port in Moroni is managed and operated by GulfTainer under a Joint Venture agreement.

Comoros does not have any legislation dealing specifically with marine pollution although the national environmental policy refers to the control and regulation of pollution in marine and coastal areas³. There is, however, a framework environmental law (1994 – amended in 1995) which provides for the preservation of diversity and environmental integrity, and makes EIA's mandatory for coastal developments. This framework legislation is, however, very general, essentially outlining the principles for environmental management. It seems the detail should be provided for in sectoral laws, although these do not appear to have been developed. Moreover, institutional, human resources, technical and financial capacity is very limited. The institution responsible for the implementation of the framework legislation is the Directorate General of the Environment which was established in 1993. The coordination of multi sectoral environmental actions is undertaken by an inter-ministerial consultative committee on the environment (“Comite Interministeriale Consultatif pour l'Environment, CICE”).

³ Information extracted from the Regional Synthesis on Policy, Legal, Regulatory and Institutional Frameworks compiled under the WIO-LaB Project (UNEP/NC Secretariat, CSIR & WIOMSA, 2009).

2.3.2 Kenya

Kenya has ratified UNCLOS, most of the relevant IMO marine pollution conventions – with the exception of the Intervention Convention – the London Convention/Protocol and the Nairobi Convention. According to Kibiwot (2008) these have not all been domesticated, although this appears have been done subsequently by the Kenya Maritime Authority which was established in terms of the Kenya Maritime Authority Act 2006 and which has subsequently produced the Merchant Shipping Act, 2009. Moreover, Article 2.1 of the new Constitution of Kenya (2010) provides that both the general rules of international law, and any treaty or convention ratified by Kenya, shall form part of the law of the country (Ruwa, 2011).

In terms of the Maritime Zones Act 1989 Cap 371, which brings the provisions of UNCLOS into force nationally, Kenya has established Territorial Waters and an Exclusive Economic Zone. It has also applied for an additional 150 miles of the continental shelf (Ruwa, 2011). Monitoring, control and surveillance of the maritime zones is dealt with in the Security Act, while the resources within the maritime zones are regulated by various sectoral laws.

In addition to the above, there is a wide a wide variety of coastal and environmental legislation dealing with pollution, in some cases resulting in overlapping and sometimes conflicting mandates. According to the report completed for the WIO-LaB project (Munga et al, 2006) the responsibility for managing marine pollution appears to be split between a number of Ministries and agencies as outlined below:

- Office of the President:
 - Department of Provincial Administration and Internal Security – approval of development plans and environmental management
 - Kenya Navy – patrolling of Kenyan waters
- Ministry of Health – chemical analyses (Mombasa lab does marine pollution monitoring)
- Ministry of Water and Irrigation – management of fresh water resources through the Water Resources Management Authority
- Ministry of Local Government – local authorities responsible for garbage collection and effluent treatment and disposal.
- Ministry of Transport and Communication:
 - Kenya Maritime Authority is responsible for the management of shipping (standards, registration and licensing, safety of navigation and maritime training)
 - Kenya Ports Authority is responsible for ports and stores oil spill response equipment
 - Oil Spill Mutual Aid Group (OSMAG) – is a voluntary association including the private sector and government agencies and is responsible for the preparation of the oil spill contingency plan and for overseeing oil spill surveillance.
- Ministry of Tourism and Wildlife:
 - Department of Fisheries – licensing of fish processing plants.
 - Kenya Wildlife Services – research and monitoring in marine reserves in collaboration with KMFRI.
- Ministry of Environment and Natural Resources – has wide powers regarding pollution under the Environmental Management and Coordination Act (EMCA, 1999) which also established the National Environment Management Authority (NEMA). This includes the power to direct any lead agency (defined as: any government ministry, department, parastatal, state corporation or local authority, in which any law vests functions of control or management of any element of the

environment or natural resource) to undertake its duties in terms of the Act. Section 55 (6) & (7) allows the Minister to issue regulations covering pollution from land-based sources, vessels, and installations or other structures in the EEZ.

In addition, Kenya Marine Fisheries Research Institute (KMFRI) is responsible for research and the provision of advice on marine pollution amongst others.

The institutional responsibilities and legislation are discussed in relation to the various categories of marine pollution below.

2.3.2.1 Landbased sources

As indicated above, the EMCA (1999) gives NEMA general powers with respect to enforcing other government agencies to fulfil their environmental responsibilities, as well as more specific powers with regard to the management of pollution, including the establishment of a Standard and Enforcement Review committee. It also introduces a requirement for Environmental Impact Assessments for certain projects. Moreover, although NEMA does not appear to have published regulations specific to pollution in the coastal zone, it has published regulations on water quality and waste management.⁴

Overall responsibility for Land-based sources of marine pollution can therefore be considered to fall under NEMA, although there are many “lead agencies” which would be responsible for specific sources. For example: the Fisheries Department (FD) is responsible for licensing of fish processing plants and local authorities for waste water treatment and disposal (Local Government Act). The regulation of land-based sources is discussed in more detail in the relevant WIO-Lab documents.

2.3.2.2 Dumping

Kenya is party to the London Convention and the 1996 London Protocol, but it is not clear to what extent this is being implemented nationally. As indicated above, Section 55 (6) of the EMCA enables the Minister to “issue appropriate regulations to prevent, reduce and control pollution or other form of environmental damage in the coastal zone”. Section 55 (7) then elaborates on this, listing various categories of pollution to which this applies. This includes (b): “from vessels, aircraft and other engines used in the coastal zone”. This terminology suggests that it applies to dumping as defined in the Convention/Protocol, but the term dumping is not used or defined in the EMCA.

It is noted that Kenya did submit reports to the LC/LP Secretariat in 2005 and 2006 indicating that no dumping permits had been issued.

2.3.2.3 Regulation of ship-related pollution

Kenya is a Member of the International Maritime Organisation (IMO) and a Party to many of its conventions (see Table I 2.1.1.2). Until the establishment of the Kenya Maritime Authority (KMA) in 2006, it was represented at the IMO by the Kenya Ports Authority. The KMA was established by Gazette Notice No. 79 of 2004 is charged with monitoring, regulation and coordination of maritime activities in the country.

⁴ Legal Notice No. 120, Environmental Management and Coordination (Water Quality) Regulations, 2006 ; Legal Notice No. 121, Environmental Management and Coordination (Waste Management) Regulations, 2006

A major output of the KMA has been the Merchant Shipping Act 2009 which consolidates ship-related legislation and amongst other things provides for the prevention of pollution, investigations into marine casualties and liability. Section 410 enables the Minister to make regulations on marine pollution including giving effect to relevant international conventions which are listed as:

- UNCLOS (1982)
- MARPOL (1973/78)
- The Intervention Convention and its Protocol⁵
- OPRC (1990)
- The London Convention⁶
- OPRC/HNS Protocol (2000)⁷
- Anti-fouling Convention
- Ballast Water Convention.

The Act does not specifically list the liability conventions (CLC and the FUND), although these appear to be covered by Section 410 (20) (j).

While the Merchant Shipping Act 2009 repeals the 1967 Act of the same name, as well as some other legislation, it does not refer to the Kenya Ports Authority Act which gives the Kenya Ports Authority (KPA), the responsibility for controlling pollution in the territorial waters of Kenya – including oil spill contingency planning. There therefore appears to be an overlap in mandates in this area, although the latest draft of the National Oil Spill Contingency Plan (NOSCP) (2007) recognizes the KMA as the competent authority.

2.3.2.4 Ports and harbours

The Kenya Ports Authority (KPA) was set up by an Act of Parliament in January 1978. It is responsible for the operation, maintenance, improvement and regulation of ports in Kenya including the ports of Mombasa (Kilindini), Vanga, Shimoni, Funzi, Mtwapa, Kilifi, Malindi, Lamu and Kiunga. Mombasa port is the largest and busiest in the East Africa region, but it is noted that there are currently plans to expand the port of Lamu to serve Ethiopia and Sudan – in particular, to export oil from Sudan (Ruwa, pers comm.)

2.3.2.5 Offshore activities

In terms of the Maritime Zones Act (1989), Kenya has proclaimed an Exclusive Economic Zone (EEZ) as per the provisions of UNCLOS and according to Kibiwot (2008), was preparing to make a submission in May 2009 for the delineation of an extended Continental Shelf. The EEZ has an area of approximately 142,000 km². The Act also provides for regulations to be made on the following terms under section 9:

“(1) Where no other provision is for the time being made by any other written law, the Minister may make regulations to regulate the exploration and exploitation and conservation and management of the maritime zones that may be necessary or

⁵ This despite the fact that according to various sources, Kenya is not Party to this Convention or its Protocol.

⁶ But not its 1996 Protocol although Kenya is Party to the Protocol which will replace the Convention. It is also noted that this agreement is not strictly an IMO Convention as it does not pertain to shipping other than the fact that a vessel may be used to transport the waste for dumping.

⁷ IMO records indicate that Kenya has not ratified this Protocol or the Anti-fouling Convention.

expedient for carrying out the objects and purposes of this Act, and without prejudice to the generality of the foregoing, for all or any of the following purposes-

(b) prescribing measures for the protection and preservation of the marine environment; ..”

The Minister is thus empowered to make regulations concerning marine pollution.

At the same time, while the Department of Mines and Geology is responsible for the management of mineral exploration in terms of the Mining Act Cap 306, pollution issues are also covered by:

- Section 55 (6) & (7) of the EMCA allows the Minister to issue regulations for the control and prevention of pollution from a variety of sources including;
 - installations and devices used in the exploration or exploitation of the natural resources of the seabed and subsoil of the exclusive economic zone; and
 - seabed activities, artificial islands, installations and other structures in the exclusive economic zone.
- Section 6 (c) of the Energy Act No. 12 of 2006 empowers the Energy Regulatory Commission (ERC) to “formulate, enforce and review environmental, health, safety and quality standards for the energy sector, in coordination with other statutory authorities”.
- Section 98 (1) of the Petroleum (Exploration and Production) Act Cap 308 1982 (revised in 1985) requires petroleum business operators to comply with the relevant Kenya Standard and in the absence of such standard any international standard approved by the Commission from time to time on environment, health and safety in consultation with the relevant authorities and in conformity with the relevant statute.
- The Mining Act requires the licensing of any mining operations, and specifically recognises the impacts of mining on the seabed and in the EEZ.

It therefore appears that there may be an overlap in responsibilities with regard to offshore activities although NEMA would play a coordinating role with regards marine pollution issues.

2.3.3 Madagascar

Madagascar is a Party to UNCLOS, the relevant IMO Conventions – excluding the Intervention Convention – and the Nairobi Convention. It is not Party to the London Convention or the 1996 Protocol.

Madagascar first established a territorial sea in terms of Decree no. 63-131 in February 1967. This was updated by Order No. 85-013 of September, 1985 which set limits for the territorial sea, exclusive economic zone and continental shelf. However, maritime boundaries with Comoros, France and Mozambique have yet to be agreed (Randrianarisoa, 2011).

There is a policy on pollution, and framework environmental legislation (UNEP/NCS & WIOMSA, 2009), but there appear to be major gaps in terms of clarifying the mandates and responsibilities of various Ministries and a lack of resources to implement them. There is also a problem related to the autonomy of different regions/provinces. A relatively recent development has been the introduction of a requirement for environmental impact assessments for a variety of oil and gas related

activities, including exploration, exploitation, pipelines, refineries and storage (Randrianarisoa, 2011).

Key institutions include the Inter-Ministerial Committee on Environment, National Council for the Environment, National Committee on Coastal and Marine Affairs, National Committee on Mines, Inter-Ministerial Committee on Mining and the Maritime Ports Authority. The latter was created by decree in 2000, and has been operational since 2004.

Although Madagascar has 18 ports, there is no specific legislation dealing with the development of harbours. The responsibility for the development and maintenance of ports is that of the Malagasy Ports Authority which falls under the Ministry of Transport and Meteorology. However, Toamasina (Tamatave) - the nation's chief port which is connected by rail with Antananarivo – Mahajanga, Diego and Tulear are independently managed.

2.3.4 Mauritius

Mauritius is a Party to UNCLOS as well as the majority of the IMO Conventions and the Nairobi Convention. It is not Party to the London Convention or the 1996 Protocol.

The Ministry of Environment and National Development has overall responsibility for environmental protection through a framework environmental law – the Environment Protection (Amendment) Act of 2008 – which provides for the coordination of environmental issues amongst the various relevant sectors. The EPA puts in place a number of different institutional structures such as The National Network for Sustainable Development (s.11), the Technical Advisory Committee (s.12), Environment Coordination Committee (s.14), and Integrated Coastal Zone Management Committee (ICZM Committee- s.50), to reinforce coordination between different government agencies. It also obliges the Director of Environment to report and respond to accidental spills of pollutants (UNEP/NCS, CSIR & WIOMSA, 2009).

There are also Regulations establishing Standards for Effluent Discharge into the Ocean (2003) and Guidelines for Coastal Water Quality. These include:

- The Environment Protection (Standards for Effluent discharge) Regulations 2003
- The Environment Protection (Effluent Discharge Permit) (Amendment) Regulations 2003
- The Environment Protection (Effluent Discharge Permit) (Amendment) Regulations 2004
- The Environment Protection (Effluent Limitations for the Sugar Industry) Regulations 1997.

The Fisheries and Marine Resources Act 2007, Wastewater Management Act 2000, and Beach Authority Act 2002 are also relevant.

Land-based sources of marine pollution are managed by:

- The Ministry of Energy and Public Utilities (Wastewater Management Authority) for effluents
- The Ministry of Local Government & Outer Islands for waste and hazardous wastes
- The Ministry of Agro Industry & Food Security for pesticides residues.

Shipping is regulated under the Merchant Shipping Amendment Act (1992) which is administered by the Director of Shipping under the Ministry of Public Infrastructure, Land Transport and Shipping. Section 199 of the Act gives the Minister the power to make a variety of regulations including any which “are necessary to implement international conventions and international regulations relating to shipping to which Mauritius is a party.” Regulations on CLC and the FUND Convention were published in 1996, while regulations relating to the various annexes of MARPOL are currently in preparation.⁸

The National Coast Guard Act 1998 establishes the National Coast Guard as a specialized unit of the Police force. It enforces the law relating to the protection of the maritime zones (established in terms of the Maritime Zones Act, 2005) and has the power to prevent any activity which is likely to constitute a threat or to cause pollution to the maritime zones, including the sea bed, the flora, the reefs, the beach and the coastline.

The Mauritius Ports Authority (MPA), formerly known as the Mauritius Marine Authority (MMA) was originally established in 1976. It was renamed as the MPA under the Ports Act 1998. Among other objectives, the MPA has also a duty to safeguard the protection of the environment and prevent any type of the pollution within the Port. Part XII of the Ports Act 1998 lists out the provisions to prevent pollution and protect the environment as well as other sections such as S.144 and S.150 of Ports Acts.

2.3.5 Mozambique

Mozambique is a Party to UNCLOS as well as the majority of the IMO Conventions and the Nairobi Convention. It is not Party to the Intervention Convention or London Convention or their Protocols.

The regulatory framework in Mozambique still comprises a combination of the old colonial legislation and laws passed since independence (UNEP/NCS & WIOMSA, 2009). Decree-Law n.495/73 of October 1973, for example, was passed by Portugal to provide for the protection of the coastal and marine environment in its overseas provinces – including Mozambique – and gave the maritime authorities the power to regulate pollution of those areas. More recently, the Environment Law of 1997 establishes a framework for environmental regulation, while the Maritime Law of 1996 provides for the establishment of maritime zones, including the territorial sea, Exclusive Economic Zone and Continental Shelf. The latter also provides for the enacting of regulations to protect these areas. However, apart from the border with Tanzania, it appears that the borders between Mozambique and its other neighbours (Comoros, France, Madagascar and South Africa) have yet to be finalized.

Shipping is regulated by the Regulation of Commercial Maritime Transport (Decree 35/2007) and ports by Decree 5/82: Direction, Organisation and Functioning of Ports. (Gove, 2011).

An Environmental Regulation on Mining Activity (ERMA), approved by the Decree n. ° 26/2004, establishes norms for preventing, controlling, mitigating, rehabilitating and compensating for the adverse effects that the mining activity may cause to the environment. Article 3 of ERMA designates the Ministry of Mineral Resources as the competent authority for the evaluation of the environmental impacts of the mining activity. The Ministry is also responsible for: monitoring compliance with the norms

⁸ Muelex website: www.gov.mu/portal/sites/legaldb/legislation/epdelaws.htm

established in the Regulation (the ERMA); issuing terms of reference for relevant environmental impact studies directives, and licenses; and exercising control over the environmental aspects in coordination with MICOA. These and other responsibilities are also incorporated in the Mining Act (2002) and the Oil Act (2001).

In 2009, Mozambique approved a Strategy for Concession Areas for Oil Operations which guides the process of identifying and allocating concessions (Gove, 2011).

The institutional framework comprises a number of organisations of which those specifically relevant to marine and coastal matters include:

- The Ministry for the Coordination of Environmental Action (*Ministério para a Coordenação da Acção Ambiental –MICOA*), under which are:
 - The National Directorate for Environmental Management (DGNA) which is responsible for the development of environmental policies, plans and standards, control of environmental quality, conservation of biodiversity, protected areas and Integrated Coastal Zone Management;
 - The Centre of Sustainable Development for Coastal Zones (*Centro de Desenvolvimento Sustentável para a Zona Costeira – CDS – Zonas Costeiras*) which provides advice on various aspects of coastal management;
 - The Coastal and Marine Research Centre (CEPAM), which undertakes research on coastal management issues (Gove, 2011);
- The Ministry of Transport and Communications, and its National Directorate for Marine Transport and Ports, under which are:
 - The National Institute of Hydrography and Navigation (INAHINA) which is responsible for “coordinating, promoting, developing and following research and works on hydrography, nautical cartography, oceanography and navigation of all Mozambique waters ;
 - The National Maritime Institute (INAMAR) – previously the Maritime Administration and Safety Authority (SAFMAR) – was established in 2004, and is responsible for the development and implementation of legislation on maritime issues, the regulation of shipping and ports, and is the IMO focal point (Gove, 2011). It is also responsible for the compilation of the National Oil Spill Contingency Plan;
- The Marine Arm of the Ministry of National Defence is responsible for the surveillance and protection of the coast;
- The Ministry of Mineral Resources established in 2005, which includes a number of internal units as well as autonomous institutions such as:
 - The National Petroleum Institute, whose role is to:
 - Generate proposals to the Ministry of Mineral Resources (MIREM) on matters related to petroleum legislation and policy.
 - Be in charge of all aspects of licensing, including promotion, negotiations and issuance of licenses.
 - Have the competence and capacity to perform petroleum resource assessments prior to licensing and during exploration, development and production.
 - Monitor and audit petroleum operations to ensure that the operators' own organizations and systems are adequate for adherence with the goals

and standards set out in the legislation, regulations, guidelines, agreements and in the operators' internal standards and codes of performance.

- Take care of the national petroleum data including its collection, storage, retrieval and distribution.
- Provide information on activities in the petroleum sector to government institutions and the public.

2.3.6 Seychelles

Seychelles is Party to a limited number of IMO Conventions including MARPOL (Annexes I and II only), CLC, FUND and OPRC. It is also party to the London Convention (but not the Protocol), and the Nairobi Convention.

UNCLOS is implemented through the Maritime Zones Act (1997, replaced in 1999) which established the Territorial Waters, Exclusive Economic Zone and Continental Shelf and provides for the regulation of various activities within the zones. The Maritime Zones (Marine Pollution) Regulations, 1981 were enacted under this to prevent and control marine pollution in these areas (Nageon, 2011). Seychelles has also laid claim to an extended Continental Shelf area, and in April 2011, Seychelles and Mauritius were granted Joint Jurisdiction by the UNDOALOS over an extended Continental Shelf area in the Mascarene Plateau area (see Fig. 1 below) (www.natureseychelles.org).

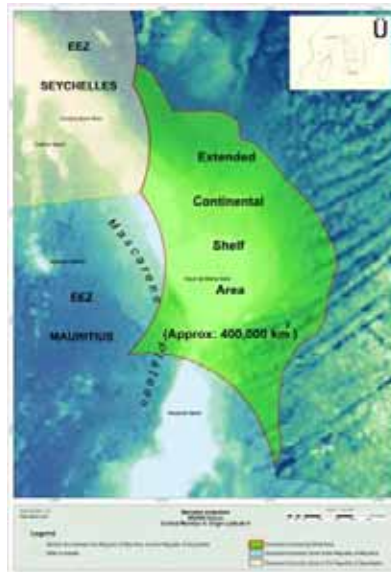


Fig. 1: Extended Continental Shelf under Joint Jurisdiction of Seychelles and Mauritius

The primary responsibility for marine pollution falls under the Ministry of Home Affairs, Environment and Transport (MHAET) which was established in 2010.⁹ The Department of Environment (Division of Pollution Prevention and Control) is responsible for land-based sources and pollution in ports. These responsibilities are conferred by Section III of the Environment Protection Act (1994), the framework environmental legislation which allows the Minister, amongst other things, to prescribe pollution standards, make regulations, classify water bodies for specific uses and develop an Integrated Coastal Zone Management Plan. A number of

⁹ There have been regular changes to the configuration of this Ministry – was previously the Ministry of Environment and Natural Resources.

regulations have subsequently been published. The Department is also responsible for monitoring and enforcement, and is supported in this regard by the Seychelles Coast Guard – part of the Ministry of Defence - which is also responsible for surveillance in the EEZ (established under the Maritime Zones Act, 1999).

The Seychelles Maritime Safety Administration is responsible for pollution from shipping, offshore oil and gas activities, and dumping.¹⁰ The Minerals Act 1991 governs the extraction of minerals, while the Merchant Shipping Act, 1992 (as amended in 1994) provides for the implementation of relevant IMO conventions, while Section 245 states:

“(1) The provisions of this Act shall be without prejudice to the laws relating to the protection of the Marine Environment or any incident involving pollution from shipping.

(2) Where there is no law or where such law is deficient in Seychelles relating to the protection of the Marine Environment or any incident involving pollution from shipping the Minister may in consultation with the Minister responsible for environment make regulations for the protection of the marine environment and other activities relating to the safety of shipping.”

The Merchant Shipping (Oil Pollution Preparedness and Response) Regulations, 2001 give effect to OPRC, CLC and the FUND.

The Seychelles Ports Authority is a parastatal organisation under the MHAET and was created under the Ports Authority Act 2004 to regulate, control and administer commercial ports within the Republic of Seychelles. It is an autonomous and self-regulated Authority governed by a Board of Directors. Shipping in the harbour is regulated by the Harbour Act and Regulations (amended in 1988) which cover traffic movements, pollution, waste management and ballast water discharge.

The fishing ports are managed by the Seychelles Fishing Authority under the Ministry of Investment, Natural Resources and Trade (Nageon et al, 2011).

2.3.7 Somalia

As indicated above, Somalia is a Contracting Party to UNCLOS and the Nairobi Convention and therefore has international and regional obligations with respect to marine pollution. However, according to their representative, although there was legislation in place historically, all documentation has been lost during the civil war.

Nevertheless, the responsibility for marine pollution appears to be assigned as follows:

Ministry of Fisheries and Marine Transport:

- Land-based sources of marine pollution;
- Pollution from offshore oil and gas and other mining activities;
- Dumping of waste at sea.

Port Authority:

- Pollution from shipping;
- Pollution in ports and harbours.

¹⁰ Information provided by Allen Chetty of the Seychelles Ports Authority.

2.3.8 South Africa

South Africa is a Contracting Party to UNCLOS, a number of the IMO Conventions, the London Convention and the 1996 Protocol, and the Nairobi Convention and has been actively involved in the GPA and regional programmes. South Africa has a dualist approach to international treaty law (sect 231(4) of the Constitution) and this is reflected in the marine pollution legislation.

The primary responsibility for the management of marine pollution is split between two Ministries, namely the Ministry of Water and Environmental Affairs, and the Ministry of Transport. The former is responsible for land-based sources and dumping, while the latter is responsible for ship-related pollution, with the implementation of the legislation being undertaken by a statutory agency, the South African Maritime Safety Authority (SAMSA). However, the Department of Environmental Affairs also plays a role in the response to oil spills as described below. Moreover, South Africa subscribes to the principle of co-operative governance, and both provincial and local government play supportive roles in the management of marine pollution.

2.3.8.1 Land-based sources

The primary responsibility for land-based sources of marine pollution is, in turn, split between the Departments of Water Affairs (DWA) and Environmental Affairs (DEA). The legal provisions for these responsibilities are found in the National Water Act, 36 of 1998 and the National Environmental Management: Integrated Coastal Management Act, 24 of 2008 (ICMA) respectively.

The DWA manages freshwater resources, and Section 21 of the National Water Act sets out water uses which require a water use licence. These include:

- discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
- disposing of waste in a manner which may detrimentally impact on the water resource;
- disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process.

The Act further makes provision for the Minister to make regulations which, amongst others, may facilitate the monitoring of water use and water resources and provide for further control of the discharge of waste into a water resource (eg. rivers which then eventually discharge into the sea).

The ICM Act is administered by the DEA and includes a Chapter on Marine and Coastal Pollution Control. Section 69 provides for the regulation of effluent discharges from land-based sources into coastal waters and estuaries.

The DEA also represents South Africa at the GPA and Nairobi Convention, and has recently published a National Programme of Action for the Protection of the Marine Environment from Land-based Activities (2008). A provincial level Programme of Action is currently being developed for the Western Cape.

2.3.8.2 Dumping

South Africa ratified the London Convention in 1978, and was one of the first Contracting Parties to the 1996 Protocol. The provisions of the Convention were incorporated into national law through the Dumping at Seas Control Act of 1980. This has now been replaced by the ICM Act (2008) which includes provisions on dumping and incineration (Sections 70 – 73) which bring the 1996 London Protocol into force nationally. The Waste Assessment Guidelines developed under the Convention are also included as a schedule to the Act.

2.3.8.3 Ports

The National Ports Authority (NPA) manages and controls South Africa's eight commercial seaports (Richards Bay, Durban, East London, Ngqura, Port Elizabeth, Mossel Bay, Cape Town and Saldanha) and is responsible for all aspects of management and control, including the maintenance and development of port infrastructure.

2.3.8.4 Regulation of ship-related pollution

The regulation of shipping falls under the Ministry/Department of Transport, although the responsibility for day-to-day management is delegated to SAMSA, which was established by the South African Maritime Safety Authority Act 5 of 1998. SAMSA's responsibilities include ensuring the safety of life and property at sea, the prevention and combating of pollution of the marine environment by ships and promoting the country's maritime interests.

Operational pollution is regulated through the Marine Pollution (Prevention of Pollution from Ships) Act, 2 of 1986 which, together with regulations, gives effect to the MARPOL Convention and the Annexes which South Africa has ratified (Annexes I, II, III and V). In addition, the Act provides for the Minister to make regulations to give effect to the provisions of the Convention, as well as to exempt certain classes of ships from the provisions of the Convention.

Matters related to accidental pollution from ships, including response co-operation and liability and compensation are covered by:

- The Marine Pollution (Intervention) Act 64 of 1987 gives domestic effect to both the Intervention Convention Relating to the Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969 as well as the Protocol Relating to Intervention on the High Seas in Cases of Marine Pollution by Substances other than Oil, 1973. It allows the Minister of Transport to make regulations to give effect to the provisions of the Convention and the Protocol.
- The Marine Pollution (Control and Civil Liability) Act 6 of 1981 (as amended) provides for the protection of the marine environment from pollution by oil and other harmful substances, the prevention and combating of pollution of the sea by oil and other harmful substances, the determination of liability for loss or damage caused by the discharge of oil from ships, tankers and offshore installations, and related matters. While SAMSA is responsible for the implementation of most of the Act, the responsibility for matters relating to the combating of pollution is assigned to the Department of Environment Affairs in terms of Marine Notice No. 2 of 1996 issued by the Department of Transport on 24 January 1996. Thus the response to spills is a shared responsibility.

- It is noted that although South Africa has acceded to the 1992 Fund Protocol this has not yet been brought into effect locally.

2.3.8.5 Offshore activities

South Africa's maritime zones are declared in terms of the Maritime Zones Act (Act 15 of 1994). Section 10 of the Act allows the authorities to take measures within these zones to protect the coastline "from pollution or threat from pollution", while Section 9 stipulates that all the laws of the Republic, including the common law, apply to offshore installations.

Offshore mining activities are regulated by the Department of Minerals and Energy in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) which states that:

- The environmental management principles in terms of the National Environmental Management Act (NEMA), 107 of 1998, are applicable;
- The holders of mining permits are responsible for managing and remedying any impacts, and are liable for any damages;
- The holders of mining permits are required to prepare an Environmental Management Plan in consultation with relevant government agencies.

They are also listed as one of the activities which, in terms of the National Environmental Management Act, 107 of 1998, is required to undergo an Environmental Impact Assessment prior to commencement.

Moreover, as indicated above, the Marine Pollution (Control and Civil Liability) Act 6 of 1981 (as amended) covers pollution not only from ships, but also offshore installations, the definition of which includes any exploration or production platform situated within the prohibited area and used in prospecting for or the mining of natural oil. Offshore oil and gas facilities are therefore required to have oil spill contingency plans in place.

2.3.9 Tanzania

Tanzania is a Party to UNCLOS, most of the relevant IMO Conventions, the London Convention (but not the 1996 Protocol), and the Nairobi Convention.

The Territorial Sea and Exclusive Economic Zone Act, 1989 establishes the maritime zones and applies to both mainland Tanzania and Zanzibar (Daffa, 2011).

The Environmental Management Act (2004) provides a framework for the regulation of environmental issues in general, with Part VIII dealing with Pollution Prevention and Control and Part IX with Waste Management. In addition to a general prohibition on pollution, it:

- empowers the Minister to make regulations on a wide variety of pollution-related matters, although it does not specifically refer to marine pollution; and
- provides for the implementation of international environmental conventions.

The EMA also overrides other legislation which is inconsistent with its provisions.

A number of regulations have been issued under the EMA of which the following are relevant here:

- The Environmental Management (Water Quality Standards) Regulations, 2007;
- The Environmental Management (Solid Waste Management) Regulations, 2009;
- The Environmental Management (Hazardous Waste Control) Regulations, 2009.

The primary responsibility for marine pollution on mainland Tanzania lies with the Integrated Coastal Management Unit of the National Environment Management Council (NEMC) which also has sole responsibility for land-based sources. The responsibility for other sources is shared with a number of agencies as follows:¹¹

- Pollution from shipping: NEMC, Surface and Marine Transport Regulatory Authority (SUMATRA), Tanzania Ports Authority (TPA)
- Pollution from offshore oil and gas (or other mining) activities: NEMC, TPA, Ministry responsible for Energy/mining.
- Dumping of waste at sea: Coastal Local Government Authorities, NEMC
- Pollution in ports and harbours: TPA, NEMC and Ministry of Infrastructure and Development / and also the Surface and Marine Transport Regulatory Authority (SUMATRA).

The EMA (2004) also mentions the powers of the Minister responsible for shipping to make regulations for the prevention of marine pollution in terms of Part XIX of the Merchant Shipping Act, 2003. The relevant Ministry is the Ministry of Infrastructure Development which has designated the Surface and Marine Transport Regulatory Authority (SUMATRA) – established in terms of the Surface and Marine Transport Regulatory Authority Act, 2001 - as the responsible authority for the implementation and enforcement of relevant laws relating to the protection of the marine environment from pollution from shipping, including the development and maintenance of the National Marine Oil Spill Response Contingency Plan (NMOSRCP). SUMATRA itself was established in 2001.

The Tanzania Ports Authority (TPA), established in terms of the Tanzania Ports Act, 2004, administers and operates all the ports in mainland Tanzania, while the two main ports in Zanzibar are run by the Zanzibar Ports Corporation (ZPC). The Ministry of Communications and Transport Zanzibar (MOCT) is responsible for the licensing and inspection of ships in Zanzibar.

There are a number of laws dealing with mining, including the Petroleum (Exploration and Production) Act 27 of 1980, the Mining Act 2010 (which repealed that of 1998); and the Mining (Environmental management and protection) Regulations 1999. The Mining Act, 2010 includes a requirement for an EIA Certificate issued under the Environment Management Act Cap 191 prior to the granting of a mining licence.

¹¹ Information provided by Rose Sallema Mtui of the NEMC.

3. Sources and Types of Marine Pollution

There are four main sources of marine pollution:

- Land-based Sources (including point sources such as municipal wastewater and industrial discharges, as well as non-point sources such as stormwater run-off, river runoff (including agricultural run-off), contaminated ground water seepage, pollutants introduced via the atmosphere and litter) are by far the biggest source of marine pollution contributing an estimated 80% globally;
- Dumping of waste into the sea (as defined under the London Convention/ Protocol) was historically a fairly common practice and included industrial wastes, sewage sludge, radioactive wastes, dredged material, geological materials such as mine tailings, decommissioned vessels and fish waste. Since the coming into force of the London Convention, some of these categories have been phased out and nowadays even those that are dumped are heavily regulated.
- Maritime Transport contributes to marine pollution through both operational discharges and shipping incidents. Operational discharges include oily wastes from the engine, oily and chemically contaminated tank washings, sewage and garbage generated by crew and passengers, and air pollution from the burning of fuel, incineration of operational wastes and the operation of refrigeration/airconditioning systems and fire-fighting equipment. Accidental spills or losses of oil, chemicals or other cargo can be as a result of collisions, groundings, foundering, fire/explosion, and/or equipment failure during bunkering or cargo transfer.
- Offshore prospecting and mining activities also contribute to pollution loads through accidents and operational discharges. Accidental discharges can be as a result of blow-outs, pipeline ruptures, tanker spillages and collisions – for example, when ships are docking at the platforms. Operational discharges include oil in produced water, drill cuttings and muds (which may contain toxic contaminants), production chemicals (e.g. residual process water, drilling additives, well treatment fluids), sewage, garbage, deck drainage, and atmospheric emissions.

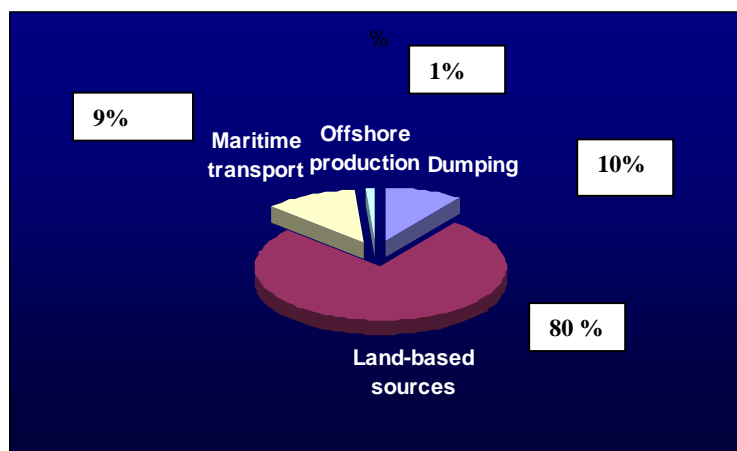


Figure 2. Primary sources of marine pollution.

In terms of types of pollutants, while some are quite specific to particular sources of pollution – for example, antibiotics are linked to mariculture operations, and TBT's to anti-fouling paints – the majority come from a range of different sources. Thus, for example, although oil in the sea is commonly linked to major oil spill incidents, in fact at least 50% of the oil entering the marine environment comes from land-based sources – see Figure 2 below.

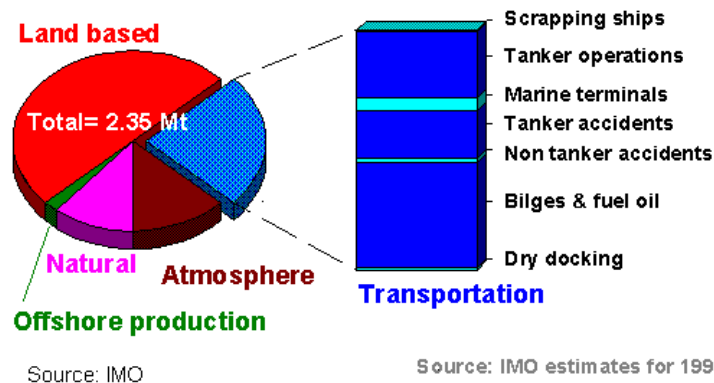


Figure 3: Sources of oil entering the marine environment.

Similarly, nutrients, hazardous chemicals and microbiological contaminants are associated with all sources. Table 4 provides a summary of the sources of different types of pollutant.

3.1 Land-based Sources in the ASCLME region

As was mentioned in Section 2.2 above, most of the countries of the Nairobi Convention/ ASCLME region participated in the recently concluded WIOLaB project. The Transboundary Diagnostic Analysis (TDA)(UNEP/NCS & WIOMSA< 2009) is available on the project website and provides detailed information on land-based sources of marine pollution in the ASCLME region and, since it is not the focus of this report, this will not be repeated here. Suffice it to say that the TDA concluded that:

“A significant amount of the pollution load to the WIO emanates from land-based activities, such as domestic and industrial effluents, and contaminated surface and sub-surface runoff from urban and agricultural areas.

The TDA found that the highest pollutant loads entering the WIO originate from the mainland states and Madagascar, with South Africa and Tanzania contributing approximately 80% of the overall loading of nutrients and organic matter.

Pollution is mainly concentrated around 39 principal hot spot areas located in and around the main urban centres such as Mombasa, Dar es Salaam, Maputo, Durban, Tuléar, Port Louis, and Port Victoria, where they affect some of the most productive areas of the coastal and marine environment, such as estuaries and near-shore waters.”

In terms of types of pollutants, the TDA identified microbiological contaminants, suspended solids, chemical contaminants, litter and solid waste, and eutrophication as a result of high nutrient levels as the most common problems.

TABLE 4: SUMMARY OF TYPES OF POLLUTION FROM VARIOUS SOURCES

SOURCE	TYPE OF POLLUTANT									
	Hazardous chemicals	Nutrients	Suspended solids	Organic matter	Micro-biological	Hydrocarbons	Litter	Thermal pollution	Biological pollution	
Land-based										
Municipal wastewater	X	X	X	X	X	X				
Industrial wastewater	X	X	X	X	X	X		X		
Urban stormwater	X	X	X	X	X	X	X		X	
Agricultural runoff	X	X	X	X	X	X			X	X
Atmospheric emissions	X	X	X	X	X	X				
Solid waste	X				X	X	X			
Dumping										
Dredged material	X	X	X	X	X	X	X			X
Sewage sludge	X	X	X	X	X	X				
Fish waste		X	X	X	X	X				
Vessels/ platforms etc	X					X	X			X
Geological material	X		X							X
Organic material		X		X						X
Bulky items	X					X	X			
Shipping										
Engine room + equipment	X					X	X			
Sewage & garbage	X	X	X	X	X	X	X			
Anti-fouling	X									
Ballast water/ hulls						X				X
Accidents	X	X	X	X	X	X	X			X
Offshore										
Oil and diamond mining	X	X	X	X	X	X	X			X

3.2 Dumping of Waste at Sea

Dumping in the context of marine pollution means the disposal into the sea of waste which has been deliberately loaded onto a vessel, aircraft, platform or other man-made structure for that purpose. It also includes the storage of such wastes in the seabed and subsoil thereof, the disposal at sea of such structures themselves, and the abandonment or toppling of platforms or other man-made structures on site (and at sea) for disposal purposes.

Similarly, incineration refers to wastes that are loaded onto a vessel equipped with an incinerator, and where the incineration takes place whilst that vessel is out at sea.

Historically, a wide range of wastes were dumped or incinerated at sea including industrial and radioactive wastes. However, although there might still be some illegal activities, these practices have been considerably curtailed by the relevant international legislation – the London Convention and its 1996 Protocol. Incineration at sea, and the dumping of industrial and radioactive wastes are now completely prohibited. Those categories of waste which are still permitted - but under strict conditions - include:

- Dredged material
- Sewage sludge
- Fish waste, or material resulting from industrial fish processing operations
- Vessels and platforms or other man-made structures at sea
- Inert, inorganic geological material
- Organic material of natural origin
- Bulky items primarily comprising iron, steel, concrete and similar harmless materials, for which the concern is physical impact, and limited to those circumstances where such wastes are generated at locations, such as small islands with isolated communities, having no practicable access to disposal options other than dumping.
- Carbon dioxide streams from carbon dioxide capture processes for sequestration

Dredged Material

In terms of volumes, dredged material is the most common waste dumped, with annual amounts of between 150 and 400 million tonnes. Of this, about 66% arises from regular maintenance dredging, for example to maintain the depth of entrance channels, in areas such as harbour and estuaries are often dumped at sea. Much of this is relatively clean, but around 10% is heavily contaminated with toxic chemicals such as trace metals and hydrocarbons.

Dredged material can also be produced during harbour construction or reclamation projects, for example, airports constructed in coastal areas.

Sewage Sludge

Sewage sludge is produced during the sewage treatment process, and historically was dumped at sea by many northern hemisphere countries, peaking at around 20 million tonnes per annum in the late 1980's. However, although the dumping of

sewage sludge is still permitted provided it meets the relevant criteria, pollutants tend to concentrate in the sludge during the treatment process, and as a result many countries have placed a ban on the dumping of sludge at sea.

CO₂ sequestration and storage

An interesting new development has been the addition (in 2007) of carbon dioxide storage in the seabed to the list of permitted activities under the Protocol. This is part of a suite of measures adopted internationally to tackle the problem of climate change and ocean acidification. It applies to large, point source emissions such as power plants, and steel and cement factories. Disposal must be into a sub-seabed geological formation, and the waste must consist overwhelmingly of CO₂. No other wastes must be added.

3.2.1 Dumping under the London Convention/Protocol

As was indicated in Section 2, four of the ASCLME countries are Contracting Parties to the London Convention and/or Protocol: Kenya, South Africa, Seychelles and Tanzania. On the other hand, all the countries are Party to UNCLOS and the Nairobi Convention, and therefore do have an obligation to regulate dumping. Moreover, since dumping includes the disposal of dredged material, it is highly likely that they are all practising “dumping”, and that, in most cases, this is unregulated.

An overview of dumping taking place within the framework of the Convention/Protocol is provided below based on reports provided by the countries to the LC/LP Secretariat. It should be noted that final reports on the website are only available up to 2006, with draft reports for 2007, 2008 and 2009.

3.2.1.1 *Kenya*

While Kenya has been a Party to the Convention for many years, and the Protocol since 2008, it is unclear how much dumping as per the definition of the Convention/Protocol actually takes place in its coastal waters. Kenya has only submitted two reports to the Secretariat – for 2005 and 2006 – both of which indicated that no dumping permits had been issued.

However, dredging does take place in the port and channels of Kilindini Harbour in Mombasa on a periodic basis both for maintenance and expansion. The dredged material is then disposed of in the adjacent deep waters beyond the reef. Since the sediments in the port contain significant amounts of particulate material and associated chemicals (e.g. nutrients, heavy metals, persistent organic contaminants, etc.) (Munga *et al.* 2006) this activity should be regulated.

3.2.1.2 *Seychelles*

Seychelles has also been a Party to the Convention for many years but, as yet, has not acceded to the Protocol. It has provided only a single report to the Secretariat, this being in 2006. The report indicates that 9 permits were issued for waste ranging from fish waste, to bulky items and sewage sludge. However, the report also

indicates that disposal was to a landfill site rather than to sea suggesting that there is a misunderstanding with regards the purview of the Convention.

With respect to dredging, the Seychelles Ports Authority (pers. comm.) indicated that the port does not require regular dredging, and that on those occasions that it has been dredged in recent years, the spoil was used for land reclamation. This in itself is of some concern, as Port Victoria was identified as a Category 2 hotspot for metals, microbiological pollutants and nutrients during the WIO-LaB project.

3.2.1.3 South Africa

South Africa has been an active member of the Convention since its ratification in 1978, and was one of the first Parties to ratify the Protocol.

Historically, in addition to dredged material, South Africa dumped obsolete ammunition, derelict vessels – in some cases with a view to creating artificial reefs – and occasionally spoiled cargoes such as rice or beans. The dumping of obsolete ammunition took place at designated deepwater sites, and was phased out from 1996 with the entry into force of the prohibition on dumping of industrial wastes globally. The other three categories continue to be dumped as they fall within the parameters of the “reverse list” of the 1996 Protocol.

A summary of dumping activities in South African waters since 2001 is provided in Table 5 below.¹²

Table 5: Dumping in South African waters since 2001

DUMPING REPORTS		
Year	# of permits issued	Waste types
2001	11	Dredged material (3,532,100 tonnes), 2 vessels, and 1 spoilt cargo (fertilisers, 15,000 tonnes) under Special Permit following a shipping incident.
2002	8	Dredged material (17,121,000 tonnes), 1 vessel (2036 tonnes).
2003	13	Dredged material (17,447,950 tonnes), 2 vessels
2004	8	Dredged material (23,907,640 tonnes)
2005	8	Dredged material (5,980,000 tonnes), 1 vessel (2000 DWT)
2006	10	Dredged material (1, 959,089 tonnes)
2007	17	Dredged material (13: capital and maintenance - 8,020,474 tonnes) 3 vessels, 1 Bulky waste.
2008	8	Dredged material (7: 2,815,090 tonnes) 1 vessel.
2009	10	Dredged material (3,726,726 tonnes – capital and maintenance.)

¹² **NOTE: Dredged material amounts include that from all ports (i.e. including West Coast), but the bulk of the material comes from East Coast ports, especially Richards Bay and Durban.**

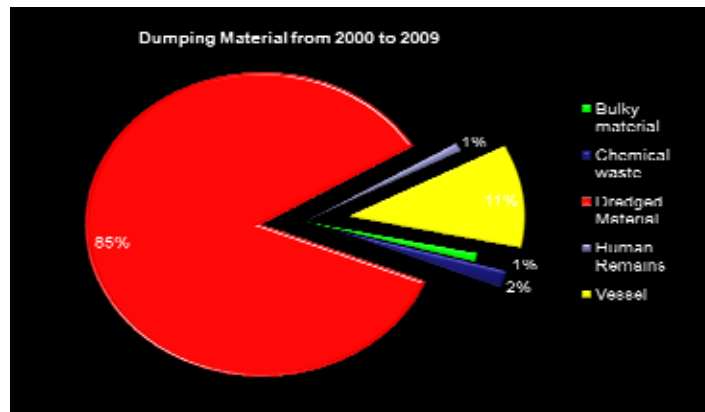


Figure 4: Percentages of different types of waste dumped between 2000 – 2009.¹³

As can be seen from the Table and Figure above, by far the greatest proportion of material dumped is dredged spoil. This is produced by both capital and maintenance dredging, with the latter being of most concern as pollutants such as heavy metals tend to accumulate in the sediments within ports. Sediments are therefore analysed prior to the issuance of dumping permits, with permits being refused for sediments carrying pollutants in excess of prohibited levels (as per Action Lists). Examples of analyses undertaken in the Port of Richards Bay are shown in Fig. 4 below, with the solid white line indicating the “Prohibited” level, and the solid dark blue line indicating levels where special treatment should be considered.

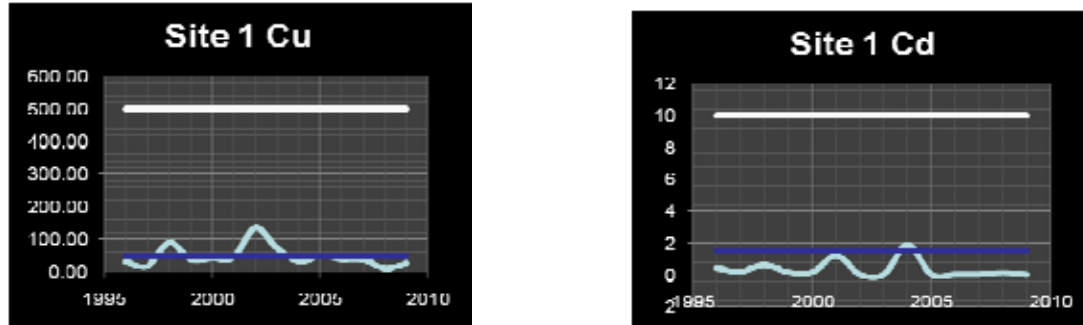


Figure 5: Levels of Copper and Cadmium at a site in the Port of Richards Bay

The Ports of Richards Bay and Durban were identified as pollution hotspots in the WIO-LaB project, while East London and Port Elizabeth were described as “emerging hotspots”.

3.2.1.4 Tanzania

Tanzania only became a Party to the Convention in 2008 and as yet has not submitted any reports on dumping to the Secretariat.

¹³ Figures provided by DEA.

However, there are a number of ports along the Tanzanian coast, including Dar es Salaam, Tanga, Mtwara and Zanzibar as well as a number of smaller ones. The port at Dar es Salaam is the largest and has high levels of heavy metal (especially chromium and copper) and organophosphates in port sediments (Mohammed *et al.* 2008). Dar es Salaam was identified as a Category 1 hotspot in the WIO-LaB project, although it is not clear whether this refers specifically to the port. Nevertheless, any dredging activities should be regulated.

3.2.2 Dredged material disposal in non-Party countries

All of the ASCLME countries have at least one commercial port, and are highly likely to be engaged in some dredging activity – capital or maintenance, or both – whether or not they are Party to the London Convention and/or Protocol. Some information on such activities in non-Party countries is available in various WIO-LaB reports as follows:

- “In the Comoros the harbour at Mutsamudu is located near a river and as a result of continued sedimentation it is becoming shallower, reducing its capacity to accommodate larger ships and vessels (Abdallah *et al.* 2006).
- Madagascar has numerous harbour facilities along its coast (Mong *et al.* 2009);
- Port Louis, the only port in Mauritius, has undergone substantial development to cater for increasing maritime activity accompanying economic development of the country. Dredging is undertaken on an ad-hoc basis in existing channels for maintenance purposes, as well as for strategic port development (Anon, 2009). As per Environmental Protection Act (Amendment) 2008, ‘Harbour dredging’ is a scheduled undertaking requiring an EIA licence.
- The four most important ports in Mozambique are Maputo, Matola, Beira and Nacala, while smaller ones include Inhambane, Quelimane, Pebane, Angoche and Pemba. Poor land-use practices result in high levels of sedimentation in coastal environments and, as a result, frequent dredging of the Maputo, Beira and Nacala harbours and their entrance channels is needed. Surveys from 10 years ago showed that between 1.2 x 10⁶ m³ and 2.5 x10⁶ m³ of sediments need to be dredged annually from the ports of Maputo and Beira respectively (FAO 1999). Studies conducted in Mozambique have shown the presence of heavy metals, particularly lead, in the Port of Maputo from discharges of the Matola and Maputo Rivers, as well as in Nacala Bay (Fernandes 1996, Anon Mozambique 2007).”

This suggests that there is a need to introduce and/or improve management of dredged material disposal.

3.2.3 Illegal dumping

Since the collapse of the Somali regime in 1991 there have been numerous reports of illegal dumping activities taking place off of the Somali coastline and allegedly involving European companies. These were recently revived as a consequence of the Asian Tsunami in December, 2004, during which a number of containers of toxic waste were broken open and/or deposited onto the shore. The 2005 UNEP Report “After the Tsunami” contains the following extract:

“Somalia is one of the many Least Developed Countries that reportedly received countless shipments of illegal nuclear and toxic waste dumped along the coastline. Starting from the early 1980s and continuing into the civil war, the hazardous waste dumped along Somalia’s coast comprised uranium, radioactive waste, lead,

cadmium, mercury, industrial, hospital, chemical, leather treatment and other toxic waste. Most of the waste was simply dumped on the beaches in containers and disposable leaking barrels which ranged from small to big tanks without regard to the health of the local population and any environmentally devastating impacts.”

In 2008 there were further reports of illegal dumping of toxic waste in Somalia (Hussein, 2010), while a Greenpeace report (2010) contains statements suggesting that some 400 containers of toxic waste were “buried” in the quays of El Ma’an port during its construction in the late 1990’s. The matter has recently been raised in the UN Security Council in the context of discussions on piracy, resulting in the adoption of Resolution 1976 (see sub-section 6.3.2.3 for further details).

The toxic waste in Somalia is reportedly impacting on the health of local people, animals and the environment and any containers remaining in coastal waters pose a significant threat to the ASCLME region as a whole. It is recommended that this be investigated as a matter of urgency.



Figure 6: A container of toxic substances washed up on the Somali coastline and impacts of such occurrences on a local inhabitant (Photos courtesy of DG: Ministry of Fisheries & Marine Transport, Somalia).

3.3 Shipping, Ports and Harbours

Shipping is essential to the global economy, providing the most cost-effective means of transporting bulk goods over great distances. Over 90% of all global trade is carried by ships, with some 50,000 merchant ships sailing the world's oceans, with a combined tonnage of around 600 million gross tonnes. These vessels include tankers (oil, chemical and liquid gas), bulk carriers, containers, and general cargo vessels and transport everything from food and fuel to construction materials, chemicals, and household items.

Unfortunately, ships also contribute to marine pollution, with the pollution emanating from shipping activities generally being divided into two main categories:

- Pollution resulting from the ship's day-to-day operational activities
- Pollution as a result of accidents.

In addition, shipping is an important pathway for invasive alien species.

Operational pollution

There are a number of different types of operational pollution from ships, with different types being more or less important depending on the class and size of the ship, amongst others. These include:

- Oily waste from the ship's engines and bilges
- Atmospheric emissions from the engines, incinerators, refrigeration and fire-fighting systems
- Sewage and garbage arising from the domestic needs of the passengers and crew
- Tributyltins and other anti-fouling compounds which leach from the painted surfaces.

Pollution from accidents

Oil spills are probably the best known of the environmental problems arising from shipping incidents, largely as a result of the massive media interest in such disasters. However, while historically they have occurred less frequently, the loss of cargoes such as hazardous chemicals, can, potentially, have even more significant consequences. Oil and cargo losses can occur as a result of:

- accidental spillages during transfer of oil in ports or at offshore moorings (most of which are relatively small)
- spills of fuel oil from vessels damaged or wrecked at sea (mostly medium sized)
- large oil spills as a result of a collision or severe damage to oil tankers while at sea
- spills or losses of cargo from cargo vessels damaged or wrecked at sea
- loss of containers overboard, which can carry a huge variety of different products, from household items to hazardous chemicals.

Pollution in Ports and Harbours

Ports and harbours are the interface between maritime and land-based activities, with most being situated within urban complexes, generally in close proximity to industrial zones. The land-based industries, together with activities such as ship building, maintenance and repair, and disposal of garbage and other waste from ships, contribute to their relatively high pollution loads. This is exacerbated by the fact that by their nature, ports and harbours are sheltered areas with low water turnover, leading to accumulation of pollutants in the sediments and biota.

3.3.1 Shipping and Ports in the ASCLME Region

According to the project document (World Bank, 2006) for the Western Indian Ocean Marine Highway Development and Marine Contamination Prevention Project (WIO Highway Project): "The shipping lanes along the East African coast are among the busiest in the world, carrying over 30 percent of the world's crude oil supplies. At any given time, hundreds of oil tankers, many of them very large crude carriers, transport crude oil from the oilfields of the Persian Gulf and Indonesia to Europe and the Americas. Over 5,000 tanker voyages per year take place in the sensitive coastal waters of Comoros and Madagascar and along the coast of East Africa, passing in close proximity to the World Heritage site of Aldabra Atoll (Seychelles)."

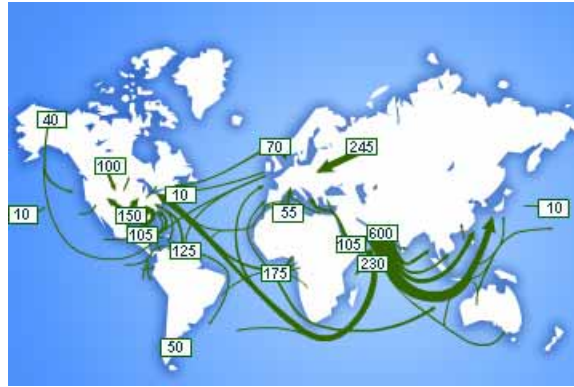


Figure 7: Crude oil transport routes: 2003

In addition, according to the UNCTAD Review of Maritime Transport 2005, some 6% of the world trading fleet – which as at 1 January 2005, comprises 46,222 ships, with a combined tonnage of 597,709,000 gross tonnes – travels to ports in the Indian Ocean. The vast bulk of the fleet was made up of: general cargo ships (18,150), tankers (11,356), bulk carriers (6,139), passenger ships (5,679) and containerships (3,165). Despite the slow down in economic growth at the end of the last decade, these numbers are likely to have increased considerably (as suggested by the figures for South Africa in Fig. 8 below) and there has been an increase in the relative percentage of container ships – at the expense of general cargo vessels. Seaborne trade in Africa as a whole grew from 780 million tonnes in 2006 to 835 million tonnes in 2007 for exports, and from 333 to 366 million tonnes for imports over the same period.

Trading activities in the region are supported by 13 major commercial ports which also serve as hubs for traffic emanating from, and destined for, Europe, Asia, the Americas and the east and west coasts of Africa. The recent increase trade has resulted in significant expansion of some ports (eg. Port Louis) and the emergence of trans-shipment. There has also been an increase in the capacity of container ports, with the top container ports in the region including Durban, Mombasa, Port Elizabeth, Port Louis, Dar es Salaam, Port Reunion, Toamasina and East London.

The increased shipping in the area, combined with limited capacity for Port state control, inevitably increases the risk of pollution as recognised by the WIO Highway Project. Of particular concern in the ASCLME region is the increasing number and severity of incidents of piracy off the coast of Somalia and in the Gulf of Aden in the past few years, with attacks in the area increasing by 200% in 2008 (UNCTAD, 2009). Apart from the criminal aspects of such incidents, they increase risks to the safety of the vessels concerned, and thus also heighten the risk of pollution.

3.3.1.1 Comoros

There are 9 ports in the Comoros, although the majority cater only for local trade and offer a limited service. The biggest of these are Mutsamudu (Island of Anjouan) and Moroni (Grande Comoro). Only Mutsamudu has a small wharf facility capable of accommodating medium sized vessels, while at the others, smaller vessels are used to transport goods ashore. The capacity of the Mutsamudu is however being reduced by sedimentation (Adbdallah et al, 2006).

3.3.1.2 Kenya

It is estimated that at any given time there are 50 ships using the shipping lanes off of the Kenyan coast, of which 9 range from 50,000 tonnes to 250,000 tonnes capacity. These include numerous oil tankers, which carry between 20,000 and 100,000 tonnes of crude oil annually from the Middle East to Europe and America, and which are believed to be the source of tar balls on the region's beaches (UNEP, 2007). There are also over sixty vessels from thirteen countries licensed to fish in Kenyan waters.

Kilindini harbour in Mombasa is the major Kenyan port, and also services a number of east and central African countries including Rwanda, Uganda, Burundi and parts of Tanzania, Zaire and Sudan. The number of ocean going ships entering Kenyan Ports annually is about 2,000. Shipping activities include bunkering and discharging crude oil and petroleum products and industrial chemicals into shore based receptacles. Operational leakages and accidental spills of these products are not uncommon. (Munga et al, 2006).

There have been proposals to enhance the facilities in Mombasa, including deepening the entrance channel, to meet increasing demand, but there are also currently plans to expand the port of Lamu to serve Ethiopia and Sudan – in particular, to export oil from Sudan (Ruwa, pers. comm.).

3.3.1.3 Madagascar

Maritime transport is very important for Madagascar, not only because it is an island, but because much of the interior is impassable by road, so that even local trade relies on shipping. It thus has numerous harbours along its coast, the main ones being Antsiranana, Mahajanga, Toamasina and Toliara. (Mong *et al.* 2009). The total volume of goods imported and exported stood at 2 million tonnes in 1998 (UNEP/NCS and WIOMSA (2009)).

Issues around the ports include a lack of adequate waste reception facilities and siltation as a result of the erosion problems caused by deforestation inland.

3.3.1.4 Mauritius

Port Louis is the only commercial port in Mauritius and has undergone substantial development in recent years to cater for increasing maritime activity accompanying economic development of the country. The port saw an increase in throughput from 176,000 TEU's in 2002, to 410,000 in 2004. This was accompanied by an increase in transshipment from 11 – 54% of the total throughput (UNCTAD, 2008). The port currently handles about 6.5 million tonnes of cargo annually and in excess of 2,000 vessels (UNEP/NCS and WIOMSA (2009)).

3.3.1.5 Mozambique

There are four important ports in Mozambique (Maputo, Matola, Beira and Nacala) and several smaller ones (Inhambane, Quelimane, Pebane, Angoche and Pemba). The larger ports handle cargo to and from Swaziland, South Africa, Zimbabwe, Zambia, Malawi and Congo and there are currently plans for their expansion to meet increasing demand. In addition, construction of a deepwater port at Dabela has recently been initiated (Gove, 2011). The larger ports are managed through private

sector concessions. Waste management around these ports is a source of concern (Anon Mozambique, 2007).

It is anticipated that coastal shipping in Mozambique is likely to expand in the near future (Gove, 2011).

3.3.1.6 Seychelles

The present Port Victoria on Mahe Island was constructed in 1974/5 and is the only large port in Seychelles. It is managed by the Seychelles Port Authority (SPA) and incorporates facilities for commercial activities, containers, the fishing industry, passenger vessels and ferries. Major issues include dredging, land-reclamation, waste from rivers and fishing vessels, food processing plants (cannery) (Antoine *et al.* 2008).

Statistics of some of the port activities are reflected in the Table below (adapted from the SPA website.) The decline in the number of port calls in 2009 is attributed to the increase in piracy in the region.

Table 6: Statistics for Port Victoria, Seychelles.

Port Activity	2006	2007	2008	2009
# of Port Calls	1,340	1,241	1,114	1,053
Throughput of commodities (tonnes)	638.15	1,024.44		
# of containers landed (TEU)	14,440	12,958	15,329	18,121
# of containers loaded (TEU) for export	16,144	12,375	15,018	17,737
# of passengers entering the port	15,522	15,221	17,070	22,012

According to Portfocus, 2003 (quoted in Nageon, 2011), the total volume of goods handled declined from 683,000 tons in 1998 to 397,000 tons in 2002.

3.3.1.7 Somalia

There are four major ports in Somalia which used to fall under Somali Ports Authority: Mogadishu, Berbera, Kismayo and Bossaso. The first three are deepwater ports, the latter is the fastest growing port in Somalia. All of these ports now fall under independent port authorities set up by local clans, as do the smaller ports such as El Ma'an and Merka.

Due to civil instability and inter-clan fighting Mogadishu is not always operational and Kismayo is closed to UN vessels although still used by commercial operators (www.logcluster.org – report from July, 2007). In 2010, the World Food Programme stated that: Mogadishu was the preferred port of discharge. However Merka, the seasonal beach port, is also heavily utilized and the country office has the option to use El Ma'an beach port in case Mogadishu is blocked due to insecurity, and the Berbera and Bossaso ports for northern Somalia (<http://logistics.wfp.org>).

3.3.1.8 South Africa

There are four commercial ports along the section of the coast of South Africa which falls within the WIO Region. These are controlled by Transnet National Ports Authority (TNPA) and are situated at Port Elizabeth, East London, Durban and Richards Bay. These ports are not only conduits for trade between South Africa and its partners in Africa, but also function as hubs for traffic emanating from, and destined for Europe, Asia, the Americas and the east and west coasts of Africa. In 2008, South African ports handled close to 13,000 vessels, over 185 million tons of cargo and 3.9 million containers (TNPA 2008, <http://ports.co.za>). The Port of Ngqura has been developed as a new deep-water port 20 km east of Port Elizabeth, together with an adjacent Industrial Development Zone. This is South Africa's primary location for major new industrial investments in the coastal zone. The new port is intended to provide development impetus in the Eastern Cape Province and is anticipated to make South Africa the hub of north-south and south-south sea traffic. Furthermore, major upgrades are currently underway at several of the other major national ports to increase handling capacity and absorb the rapid increase in commercial traffic. At present, available information¹⁴ suggests that more than 50% of the vessels passing the coast do not call at South African ports.

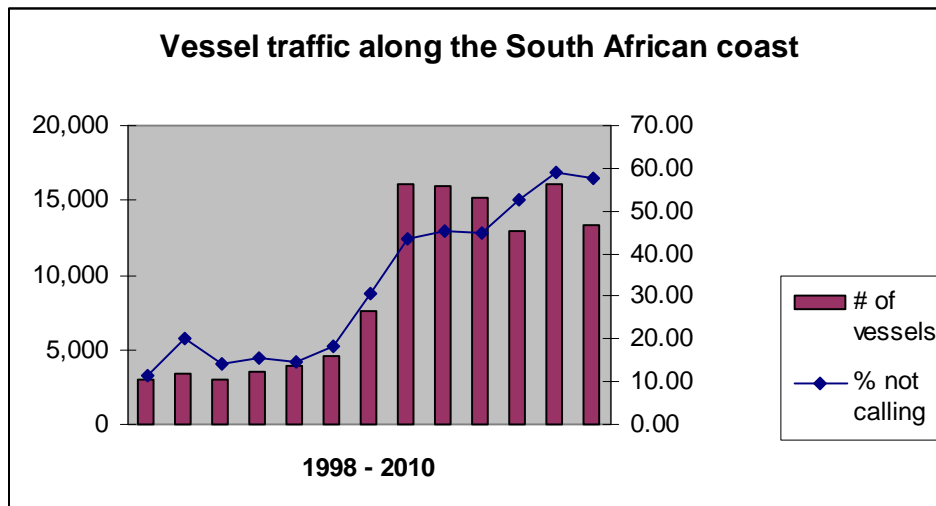


Figure 8: Vessel traffic along the South African coast.

3.3.1.9 Tanzania

The major ports in Tanzania are Dar es Salaam, Tanga, Mtwara and Zanzibar with smaller ports at Kilwa, Lindi and Mafia. Of these, Dar es Salaam is the largest serving not only Tanzania, but a number of land-locked neighbouring countries. It has a capacity of 4.1 million (dwt) dry cargo and 6.0 million (dwt) bulk liquid cargo. The Port has a total quay length of about 2,000 metres with eleven deep-water berths and handles about 95% of the Tanzania international trade (www.tanzaniaporta.com)

The WIO-LaB project identified Dar es Salaam harbour as a pollution hotspot, with sediments containing high levels of heavy metal and organophosphates (Mohammed et al, 2008). Pollution from harbour activities includes spills of petroleum hydrocarbons (oil) and chemicals and general waste management.

¹⁴ Provided by SAMSA.

3.3.2 Management of Shipping Traffic

3.3.2.1 *Navigation Systems*

Although all the countries in the region have some charts and other aids to navigation, the charts are frequently out of date as a consequence of underground seismic activity in the area. Moreover, the technology used to compile the charts and for other aids is often obsolete. These issues are currently being addressed by the GEF-funded Western Indian Ocean Marine Highway Development and Coastal and Marine Contamination Prevention Project (WIO Highway Project), the development objective of which is to “.. *increase the safety and efficiency of navigation...by establishing a demonstration marine highway to guide ships around environmentally sensitive areas and through selected busy sea lanes and by supporting widening the regional agreement on port state control and implementation of its provisions.*”

3.3.2.2 *Port state control.*

Kenya, Mauritius, Mozambique, Seychelles, South Africa, and Tanzania are parties to the Indian Ocean Memorandum of Understanding for Port State Control signed on June 5, 1998. Only South Africa, however, has implemented a port state control system, which aims to verify whether foreign flag vessels calling at the ports of the state comply with applicable international conventions and with national laws. The other countries have yet to implement an inspection regime. For example, nearly all the 265 inspections carried out in 2003 were carried out by SAMSA. Mauritius carried out one inspection and the other countries carried out none. Comoros and Madagascar are not currently parties to the memorandum of understanding. As indicated above, this is being addressed through the WIO Highway Project.

3.4 Offshore exploration and exploitation

A variety of different mineral resources are extracted from the seabed, the most common on the African coast being diamonds and oil. Since diamonds are limited to the west coast, this discussion is limited to the exploration for and exploitation of oil and gas. Both involve a range of activities all of which can contribute to marine pollution. These include:

Exploration phase:

- seismological surveys (surveys of the seabed and its subsoil, including sample taking)
- exploration drilling.

Exploitation phase:

- establishment and operation of drilling platforms which include accommodations for the personnel
- development drilling
- recovery, treatment and storage of the resource
- transportation to shore by pipeline and/or ships
- maintenance, repair and ancillary operations.
-

In addition to any pollution associated with the vessels involved in these activities, offshore oil and gas operations may generate pollution as a result of:

- o oil spills from deepwater release/ blow-outs
- o disposal of drilling muds and cuttings

- discharge of produced water
- atmospheric pollution from gas flaring.

3.4.1 Oil and gas exploration and exploitation in the ASCLME region¹⁵

The Western Indian Ocean has long been viewed as having potential for oil and gas. Exploration activities in the region date back to at least the 1950's but, despite some positive results, tapered off with the drop in the oil price in the mid-1980's. More recently there has been renewed interest in the area as a result of improved information on and understanding of the geology of the area, discoveries of onshore oil reserves and gas finds offshore of Mozambique (Pande and Temane) and Tanzania (Songo Songo) (Boote and Matchette-Downes (undated)). Exploration has thus resumed – or is scheduled to be resumed shortly – in a number of areas.

3.4.1.1 *Comoros*

Although the Comoros Islands are located within the boundaries of the rock formation considered to have hydrocarbon potential, there has been limited exploration in their waters to date. GTX have however acquired speculative seismic data around the islands, where the most prospective areas are offshore, and near to Grande Comores.

3.4.1.2 *Kenya*

British Petroleum (BP) and Shell began exploring for petroleum in Kenya in 1954 in the Lamu Embayment where they drilled ten wells. Lamu Basin with an aerial extent of 169,121km² covers both the onshore and offshore areas of the Kenya coast and has sediment thickness ranging from 3km (onshore) to 13km (offshore). At the time, none of the wells were fully evaluated or completed for production despite several indications of oil staining and untested zones with gas shows. In 1975 further explorations revealed oil and gas shows, and in 1982 a further three wells were drilled in the offshore portion of the Lamu Basin.

In 1986, the petroleum exploration and production legislation in Kenya was revised to provide suitable incentives and flexibility to attract international exploration interest in the country. This led to further exploration (mainly onshore) with a group of companies led by Amoco and Total drilling another ten (10) wells, 8 of them in Anza Basin and 2 in Mandera Basin between 1985 and 1990. The wells were dry but with indications of oil and gas.

In 1991, National Oil initiated an in-house study of the Lamu Basin as part of a long-term strategy to re-evaluate the existing geological, geophysical and geochemical data relating to each of the sedimentary basins in Kenya. The Lamu Basin study was completed in 1995 and on this basis the Lamu embayment (both onshore and offshore) was sub-divided into ten (10) exploration blocks (see Fig. 9 below). Two (2) more exploration blocks have been created since the year 2001.

This generated new interest in the offshore Lamu Basin, and a number of offshore blocks were acquired by Dana Petroleum/Woodside Energy between August and October 2003. These cover some 47,500 km² and depths up to 3,000m. Blocks L17 and L18 in the central and south coast areas from north of Mombasa to the border

¹⁵ Information from websites of the relevant government agencies, companies and Oil Watch.

with Tanzania have also been leased, with EAX (a subsidiary of Afren) conducting seismic surveys there during 2010.¹⁶



Figure 9: Oil exploration blocks in Kenya.

3.4.1.3 Madagascar

Exploration in Madagascar goes back over the past century with fairly extensive drilling taking place between 1945 – 1965. More recently there have been significant finds both on and offshore which have demonstrated potential for heavy oil, tars and asphalts, light crude oil and gas. In 1995 Madagascar delineated a series of offshore blocks and signed exploration agreements with Triton and Gulfstream Resources Canada (1997), although some of these rights have subsequently been relinquished or sold.

Currently, offshore blocks in the north west are held by Sterling Energy and ExxonMobil, but drilling plans appear to be on hold because of political uncertainty. Avana – a Madagascar-based company – is also looking at the blocks off of the north east in collaboration with EAX and Gippsland Offshore.

Limited onshore production commenced in 2008.



Fig. 10: Oil exploration blocks in Madagascar

¹⁶ Information primarily from www.nockenya.co.ke and www.afren.com.

3.4.1.4 Mauritius

In 2003 there were press reports that India and Mauritius had signed an MoU to cooperate in the exploration for oil and gas in Mauritius' EEZ. The Indian Navy would also assist in the surveillance of the EEZ. A subsequent report stated that an Indian Company (ONGC) might get exploration rights in Mauritian waters, but it is unclear whether there has been any further development

On a different note, the US Geological Survey (2009) reported that Mauritius has polymetallic nodules on the ocean floor at a depth of about 4,000 meters (m) and extending from 400 kilometers (km) to 800 km north of Port Louis. The nodules average more than 15% iron and manganese and more than 0.35% cobalt.

3.4.1.5 Mozambique

The search for oil and gas in Mozambique started around 1900 (National Petroleum Institute website – www.inp.gov.mz). There are now two main areas of activity, the Rovuma Basin just south of the border with Tanzania, and Sofala Bay near Xai Xai in the central to southern part of the country.

The first liquid hydrocarbons in this region were reported by Agip in the Mnazi Bay #1 well in the early 1980's, with Anadarko completing drilling of the first well in the Rovuma Offshore Area 1 in August 2010. The two northernmost of a total of six offshore blocks are under intensive exploration by Andarko and various partners with finds to date including both liquids and gas. Other blocks are held by Statoil and Petronas. Anadarko Petroleum and its partners in Mozambique have made discoveries in Offshore Area 1 – Lagosta, Windjammer and Barquentine, and more recently (2011) at the Tubarao prospect in the offshore Rovuma Basin, increasing the likelihood of an LNG development.



Figure 11: Oil exploration and exploitation blocks off of Mozambique

Significant gasfields are located onshore in Inhambane Province with the Temane and Pande gasfields expected to provide a 35-year supply. The development of Temane began in January 2004 while Pande started in 2008. The project is operated by Sasol with most of the gas being piped to supply chemical plants in South Africa

although a gas-fired power station is also planned in Mozambique. The first offshore gas discoveries were made in 2008, and in November 2009, Sasol also acquired exploration rights for the M-10 and the Sofala offshore licenses adjacent to Blocks 16 and 19.

3.4.1.6 Seychelles

Exploration activity in Seychelles was initially promoted by the government owned Seychelles National Oil Company (SNOC) and commenced in 1979 with seismic surveys which revealing several leads. Between 1980 and 1981 Amoco then drilled three wells and commissioned further surveys but, despite significant shows, relinquished the acreage in 1986 following the collapse of oil prices. Further surveys were conducted by other companies between 1995 and 1991.

In 2005, SNOC merged with the Seychelles Petroleum Company Limited (SEYPEC) which is currently managing exploration activities. In November 2008 EAX (75% interest) and its partner Avana (25% interest) were awarded a Petroleum Agreement for Areas A, B and C (A and B in the northern half of the Seychelles plateau, and C in the south). The agreement had an initial exploration period of two years, followed by two additional exploration periods prior to an exploitation phase lasting up to 25 years. EAX has conducted a two-year study of 43,000 square kms (17,000 miles) that involved shooting 3,650 kms of new seismic data, and said it had signs of a huge reserve within the offshore sector of the Seychelles plateau in relatively shallow water. SEYPEC has subsequently acquired a 10% interest in EAX's parent company, Black Marlin Energy and signed a co-operation agreement with Fugro and Geomahakarsa for the acquisition, processing, and licensing of geoscientific data (Nageon, 2011).

In December 2010 the press reported an announcement by the Finance Minister that two foreign companies exploring for oil in Seychelles had confirmed they would start drilling for oil in the Indian Ocean archipelago by the end of 2012.



Figure 12: Oil exploration blocks in the waters off of Seychelles.

3.4.1.7 Somalia

There has been exploration in onshore blocks in the Puntland area by Africa Oil (Canada) and Range Resources (Australia) (USGS)

3.4.1.8 South Africa

The first offshore well in South Africa was drilled off the Southern Cape coast in 1969. Ongoing exploration in this area between 1980 and 1983 resulted in the discovery firstly of the FA gas field in Block 9 of the Bredasdorp Basin, and then the EM field. These finds included gas and a light oil and led to the establishment of the Gas-To-Liquid project in Mossel Bay. 1988 saw the discovery of Oryx, the first of South Africa's current oil-producing fields. Oryx is 100% owned by PetroSA, an entity wholly owned by the government of South Africa. PetroSA also has a majority ownership of the Sable and Oribi fields, also in the Mossel Bay area, where oil production commenced in 1997.

Oil exploration has also occurred on both the west and east coasts of South Africa. In 1997, Phillips Petroleum South Africa Ltd and co-venturers were awarded the exclusive rights to explore for oil and gas in Block 17/18 off the east coast. The agreement included the gathering of seismic data as well as the drilling of at least one exploratory well but did not result in any significant finds. These blocks were re-offered during a new licensing round in 2005, with Silver Wave Energy set to commence with the acquisition of additional seismic data and exploratory drilling shortly.



Figure 13: Oil exploration blocks off of South Africa's east coast (after Xiphu, 2010).

3.4.1.9 Tanzania

Oil exploration in Tanzania goes back for about 50 years with many multinational petroleum companies having been awarded exploration rights in the area through the Tanzania Petroleum Development Corporation (TPDC website – www.tpdz.com). A considerable volume of seismic data has been collected and a number of exploration and development wells drilled. Although no petroleum has been produced to date, the data demonstrates potential for oil in the Rovuma Basin and Mafia Deep Offshore Basin.

Moreover, there are already established gas fields in the area. The Songo Songo gas field – discovered in 1974 by AGIP - is located on and offshore Songo Songo island, about 15km from the Tanzanian mainland and 200km south of Dar es Salaam. The project serves two onshore and three offshore natural gas wells at the island, the gas from the wells being piped to a Gas-to-Power (GTP) plant on the island.

The Mnazi Bay/Msimbati Gas Fields – also discovered by AGIP in 1982 - are located in the Mtwara region of south-eastern Tanzania, bordering on Mozambique. The concession was relinquished by AGIP and acquired by Artumas which was subsequently issued a development license by the government of Tanzania. Artumas initiated development of the GTP project in 2005, with the first electricity being generated in 2006. The Mnazi Bay gas fields also showed traces of a light crude.



Figure 14: Oil discoveries in Tanzania.

There are also two smaller fields: Mkuranga (about 60 km South of Dar es Salaam discovered in December 2007) and Kiliwani North (about 2.5 km South East of Songo Songo Island discovered in April 2008).

The Tanzanian Rovuma basin (which overlaps the border with Mozambique) is being further tested by a number of companies including Cove Energy, Anadarko, Artumus, Aminex, Tullow and Maurel et Prom, while Dominion Petroleum (DPL) – based on seismic data acquired between 2008 and 2010 - is looking at the possibility of a well in Block 7 (due east of Dar es Salaam) in 2011.

4 Marine Pollution Contingency Planning

Although the bulk of marine pollution comes from land-based sources, and even that from shipping is primarily a result of operations, accidental spills continue to make the headlines. The majority of these are oil spills but there is also a risk of spills of hazardous chemicals, toxic wastes and nuclear materials (fuels or wastes) - and, in fact, anything potentially toxic which is carried as cargo on board ships. Even solid cargoes - such as iron ore – which are inert, are likely to have a physical impact at least in the immediate vicinity of the spill site. It is therefore important that contingency plans be put in place to deal with such events.

The response to any disaster is generally complex and involves a range of organisations, often with conflicting priorities. The purpose of a contingency plan is to provide a policy and response framework for responding to an incident thereby enabling a rapid and effective response.

This section thus looks both at the records of spills in the region, and current contingency arrangements.

4.1 Major oil spills in the ASCLME region

The International Tanker Owners Pollution Federation (ITOPF) maintains a database of spills from tankers going back to 1967. The data held includes the type of oil spilled, the spill amount, the cause and location of the incident and the vessel involved and the database now covers nearly 10,000 incidents. Spills are generally categorised by size, <7 tonnes, 7-700 tonnes and >700 tonnes, with the vast majority (82%) falling into the smallest category i.e. <7 tonnes.

The data also shows that there has been a decline in the number of major spills and the volumes of oil spilled over this period despite increasing volumes of oil traded.

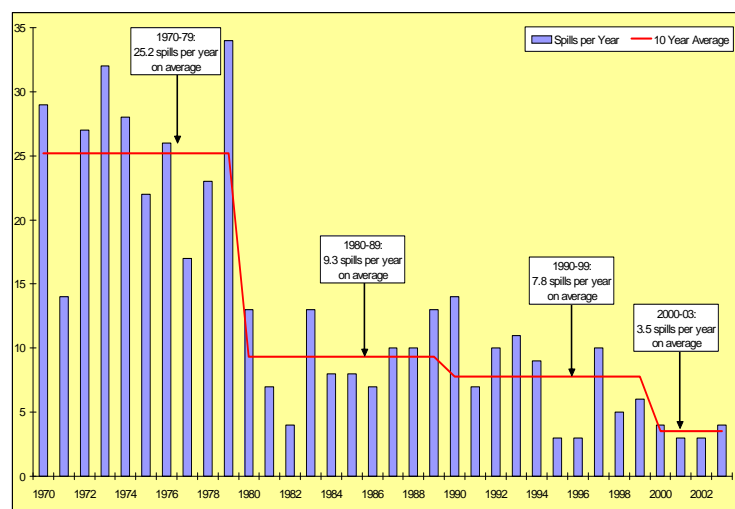


Figure 16: Trends in the volume of oil spilled (after ITOPF).

The only major oil spill listed by ITOPF in the ASCLME region since 1967 is the Katina P which was the result of the sinking of the Greek tanker, Katina P off of Maputo in 1992. The tanker had suffered hull damage while en route to the Persian Gulf and spilled an estimated 13,000 tonnes of #6 heavy fuel oil in the Mozambique channel before being deliberately grounded about 40km north of Maputo, where it

leaked a further 3,000 tonnes. With the assistance of South Africa, the vessel was then towed back into the channel with the intention of transferring the remaining oil into another tanker, but it sank in 2000 meters of water, 173 km from the Mozambican coast and 440 km north-east of Maputo.

The spilled oil was transported by the Agulhas current into Maputo Bay, the estuaries of the Incomati and Matola rivers, mangrove swamps of Montanhana and Catembe, beaches of Catembe, Polana, Costa do Sol and Bairro dos Pescadores, Xefinas Island, and much of the east coast of South Africa.

The Castillo de Bellver spill in 1983 is also listed by ITOPF, but took place on South Africa's west coast.

4.2 Shipping Casualties

While it is the major oil spills which generally attract media and public attention, it should be noted that the extent of environmental damage is not necessarily proportional to the volume of oil (or other hazardous material) spilled. In fact the location of the spill – particularly its proximity to sensitive resources – weather conditions at the time of the spill, and the type of oil also influence the environmental and socio-economic impacts.

It was therefore considered important to also summarise information on smaller spills in the region, although it is noted that this is not readily available. The IMO does have a database of shipping casualties, although this is based on reports submitted by IMO Member countries. It has many gaps and most reports do not refer to any oil spillage. Moreover, the accuracy of the data is not guaranteed. The database lists casualties according to the following classification: "very serious casualties", "serious casualties", "less serious casualties" and "marine incidents" where:

"Very serious casualties" are casualties to ships which involve total loss of the ship, loss of life, or severe pollution, in which case "Severe pollution" is defined as pollution which, as evaluated by the coastal State(s) affected or the flag State, as appropriate, produces a major deleterious effect upon the environment, or which would have produced such an effect without preventive action.

"Serious casualties" are casualties to ships which do not qualify as "very serious casualties" and which involve a fire, explosion, collision, grounding, contact, heavy weather damage, ice damage, hull cracking, or suspected hull defect, etc., resulting in:

- *immobilization of main engines, extensive accommodation damage, severe structural damage, such as penetration of the hull under water, etc., rendering the ship unfit to proceed, or*
- *pollution (regardless of quantity); and/or*
- *a breakdown necessitating towage or shore assistance.*

The summary below is largely based on the IMO database together with information received directly from the countries.

4.2.1 Comoros

The IMO database does not include any reports from Comoros, nor were any other reports provided.

4.2.2 Kenya

The IMO database does not include any reports from Kenya. However, the WIO-LaB TDA (2009) quotes the following: *“Spillage from the British tanker Cavalier caused considerable damage and destruction of mangrove forests in Mombasa in 1972. Since then, this coastline has been subjected to five other severe spills. Such spillage has resulted in mangrove dieback, especially in Mida Creek where the effects of oil spills were still evident 10 years after the last oil spill incident (Abuodha and Kairo 2001).”*

In addition, the Kenyan National Oil Spill Response Contingency Plan (2007) lists the following spills as a result of groundings near the entrance to the Port of Mombasa (Table 7) or collisions or sinking within the port (Table 8).¹⁷ It is noted that neither table includes records since 1994.

Table 7: Spills emanating from groundings near the Port of Mombasa.

DATE	VESSEL NAME	GROUNDING LOCATION	OIL VOLUME (MT)
April 1973	Globe Star (cargo Vessel)	Leven Reef	1,000
July 1977	Mango (cargo vessel)	Leven Reef	750
June 1978	Olga Ulyanova (Cargo)	Ras Mwakisenge (Likoni)	1,225
July 1978	Fortune Star (Cargo vessel)	Leven Reef	1,020
Nov 1979	Vishva Tet (cargo)	Leven Reef	250
April 1980	Chtysovalandou D. (cargo)	Ras Mzimili Florida Night Club	850
July 1981	Alpha Mayor (Fishing Trawler)	Andromache	200
May 1982	Eva (Crude Oil Tanker)	Ras Serani	80,000
May 1983	Sanko Cherry (Crude Oil Tanker)	Ras Serani	79,000
November 1983	Apulia (Cargo vessel)	Ras Mzimili Reef	700
August 1983	Mtwara (Cargo vessel)	Florida Night club	500
November 1987	Silago Express (Cargo vessel)	Leven Reef	750
July 1988	Kipevu “0” Power Station	Makupa Creek	3,000
December 1988	Atlantic Maru (Crude Oil Tanker)	Andromache Reef	77,000
February 1989	Aspia (Cargo vessel)	English Point	1,750
July 1990	Benora (Crude Oil Tanker)	Leven Reef	67,000
November 1992	Khalaf (cargo vessel)	Leven Reef	75
May 1993	Ong Brothers (Cargo vessel)	Mbaraki Creek	75
June 1993	Sunneta (Crude Oil tanker)	Leven Reef	81,000
18 April 1994	Lavest (cargo-coal vessel)	Leven Reef	575

¹⁷ It should be noted that many of these would be considered “Major” spills should the volumes cited be correct. Since they are not listed in international statistics, it is suggested that for the majority, the volumes are more likely to be litres.



Figure 17: The Port of Mombasa

Table 8: Spills emanating from collisions within the Port of Mombasa

DATE	VESSEL NAME	LOCATION	INCIDENT	OIL VOLUME
May 1972	Chenad (cargo Vessel)	Kilindini Harbour (K2 Buoys)	Fire – Sinking	1,500
June 1981	Ngamia (Tug Boat)	Dock yard	Sinking	400
November 1981	Raphaella (cargo vessel)	Kilindini Harbour	Fire – Vessel Sinking	1,625
September 1983	Sosco 1 (Oil barge)	Kilindini Harbour	Sinking	150
August 1984	Agia Marina (Cargo vessel)	Port Reitz	Fire – Sinking	150
February 1990	Alpha K Oil Barge	SOT	Collision with cased oil jetty	500
August 1991	Noreen - Oil Tanker (ALBA)	SOT	Collision with Jetty (SOT)	500
27 April 1994	Lavest (cargo-coal vessel)	Off Malindi coast (40 miles)	Sinking after Msa- refloating	700
29 April 1994	Mtongwe Ferry	Kilindini Harbour	Sinking. Most passengers died	Unknown
May 1994	Lucy I Bunkering vessel (ALBA)	SOT	Three incidents collision with Jetty.	100
28 May 1994	Ascot Bukering Vessel (ALSECO)	SOT	Collision with Oil Jetty	57
6 July 1994	Ascot Bunkering Vessel (ALSECO)	SOT	Collision with Oil Jetty	120

4.2.3 Madagascar

The IMO database lists a single incident for Madagascar, namely, a Panamanian registered bulk carrier named Lissom which was involved in a serious casualty 1,400 nm N.E. of Madagascar on the 16th December, 2001. No other details are provided. However, a report from www.allbusiness.com dated April 2002 states that: “ The Panama-flagged M/V Lissom, carrying 24, 000 tons of rice from China to West Africa, was damaged beyond repair in a fire off Mozambique in January. News that the entire crew were missing only came to light one month later. The vessel has been towed to Maputo where the cargo was to be offloaded for sale.”

4.2.4 Mauritius

The IMO database lists two casualties for Mauritius as follows:

- The Sea Splendour, an oil tanker registered in the Bahamas en route from Mauritius to Chittagong, Bangladesh on the 31st December, 2001 was involved in a very serious casualty.
- The Parida, a passenger/RoRo Cargo ship registered in Antigua and Barbuda, was involved in a serious casualty in an area north west of Mauritius on the 21st November, 2003. The vessel had suffered machinery damage.

No further information is available on either case.

4.2.5 Mozambique

The IMO database includes four incidents off the Mozambique coast as follows:

- The Beira 5, a Korean-registered fishing boat was involved in a very serious casualty 60 miles east of Mozambique on the 2nd June, 2002;
- The Geroi Sevastopolya – a Russian-registered oil tanker – and the Iran Amanat – a bulk carrier registered in Iran – were involved in a serious casualty in the northern Mozambique channel on the 5th June, 2001 (presumably a collision);
- The Captain Yannis L, a bulk carrier flying a Maltese flag was involved in a serious casualty in the Mozambique channel on the 9th February, 2001;
- The Tema, a Panamanian-registered container ship suffered damage to its propeller after striking a foreign object in Beira on the 27th May, 2000.

4.2.6 Seychelles

The IMO database lists a single incident for Seychelles involving the French fishing vessel, Le Titan on the 3rd December, 2008. The incident occurred in Port Victoria and involved an ammonia gas leak linked to the refrigerated holds on the vessel. It resulted in six deaths.

4.2.7 Somalia

The IMO database lists a number of recent incidents off Somalia, including:

- The CEC Future, a general cargo vessel registered in the Bahamas, was hijacked by pirates off the coast of Somalia on the 7th November, 2008. The vessel was released on the 16th of January 2009;
- The Captain Stefanos, a bulk carrier registered in the Bahamas, was hijacked by Somali pirates on the 21st September, 2008;

- The Reef Azania, a general cargo vessel registered in St. Vincent and the Grenadines, went missing on the 24th June, 2007 while en route to the Seychelles from Dubai. It was carrying mainly containers on deck, and was never found;
- The Himbol, an Eritrean general cargo vessel was involved in a very serious casualty on the 10th July, 2003;
- The Able I, a Panamanian-registered general cargo ship, was involved in a very serious casualty 90 miles off the coast of Somalia on the 25th June, 2003;
- The Safmarine Narmada, a general cargo ship registered in Cyprus was involved in a serious casualty off Mogadiscio;
- The Tania, a Panamanian-registered oil tanker was reported to have arrived at the outer anchorage at Berbera on the 5th May, 2001, although there is no description of any problem;
- The Aris, a Panamanian-registered bulk carrier was reported as having been involved in a serious casualty on the 28th March, 2000.

In addition, it was reported that there was an oil spill in 1990 in the Bravo District involving a vessel named the MV Malita One.

4.2.8 South Africa

The IMO database includes 14 casualty reports from South Africa since 2001 of which 9 fall within the ASCLME region. These are summarised in the Table below.

Table 9: Casualties off the South African coast since 2001.

Date	Location	Vessel	Type of casualty	Other information
05/10/2006	Off Richards Bay	Mineral Libin (Bulk carrier)	Very serious (fatality)	Incident during ballasting
26/09/2006	Indian Ocean	Ual Antwerp (general cargo)	Less serious	Container & pontoons lost overboard in heavy weather
26/06/2006	East London	Safmarine Agulhas (container ship)	Very serious	Engine failure led to grounding near harbour entrance. Broke in 2 about a month later.
03/05/2006	300 nm SE of Port Elizabeth	Alexandros T (bulk carrier)	Very serious	Catastrophic structural failure led to sinking. Loss of some crew and iron ore cargo.
05/09/2005	SW of Port Elizabeth	Jupiter 6 (Tug)	Very serious	Missing assumed lost (towed vessel located)
10/09/2002	22 nm off Richards Bay	Jolly Rubino (Ro-Ro cargo ship)	Very serious	Fire/explosion of containers on deck containing hazardous chemicals led to grounding.
17/07/2002	70 nm NNE of East London	Nino	Serious	No details
04/03/2002	Off Port St. Johns	Tropical (fishing vessel)		No details
20/08/2001	250 miles off of Richards Bay	Kitsa (bulk carrier)	Serious	No details

Of these, the Jolly Rubino was the most serious from an environmental perspective given that it involved the loss of hazardous chemicals and oil in close proximity to the Lake St. Lucia Wetlands Park – a World Heritage site.



Figure 18: The Jolly Rubino aground just north of Richards Bay

Additional information on some of the larger oil spills on South Africa's east coast between 1968 and 2000 is provided in Table 10 below.

Table 10: Summary of oil spills of the east coast of South Africa

Date	Location	Vessel	Oil Volume (tonnes)	Oil type	Clean up costs
1968	NE of Durban	World Glory	15,000 – 45,000	Crude	Approx. R 300,000
1990	Richards Bay	Petingo	1,650	HFO	Approx. R 3 million
1996	East London	Cordigliera	1,000	Bunkers/lube	Approx. R 2 million.

4.2.9 Tanzania

The IMO database does not include any records for Tanzania. However, a report prepared for the WIO-Lab project referred to sporadic crude oil spillage from the Single Buoy Mooring (SBM) point outside Dar es Salaam Harbour, with a particularly bad incident in January 1984 (Mohammed et al, 2008). Other incidents have occurred at the Tanzania and Italy Petroleum Refinery (TIPER) and at the harbour/ferry (R. Sallema, pers. comm.)

4.3 International and Regional Arrangements

Arrangements at the international level intended to facilitate response to spills of oil and/or hazardous chemicals include:

- the Oil Preparedness, Response and Co-operation Convention
- the OPRC-HNS Protocol
- the establishment of industry stockpiles.

At the regional level, the Nairobi Convention has a Protocol concerning Co-operation in Combating Marine Pollution in Cases of Emergency in the Eastern African Region, and more recently a Regional Contingency Plan has been drafted under the WIO Marine Highway Project.

4.3.1 OPRC 90

The OPRC was adopted in November 1990 and entered into force in May 1995. The Convention is designed to facilitate international co-operation and mutual assistance in preparing for and responding to a major oil pollution incident and to encourage States to develop and maintain an adequate national and regional capability to deal with oil pollution emergencies.

Parties that have ratified the OPRC Convention must put in place an effective national response system including a national oil spill contingency plan (NOSCP), local plans covering offshore units, ports and oil handling facilities, and designated national authorities. They are also required to have a minimum amount of equipment in place, and to have a programme of exercises and training. In the case of Flag states, their ships are required to have an onboard oil pollution emergency plan. In addition, they are obliged to report on any incidents.

All the ASCLME countries with the exception of Somalia and South Africa are Party to the OPRC Convention.

4.3.2 OPRC-HNS Protocol (2000)

The Protocol on Preparedness, Response and Cooperation to Pollution Incidents by Hazardous and Noxious Substances (HNS), 2000 or the OPRC-HNS Protocol expands the scope of OPRC to include pollution incidents by hazardous substances other than oil. It was formally adopted in March 2000 by States already Party to the OPRC Convention and entered into force on 14 June 2007.

At present, none of the ASCLME countries have ratified this Protocol (1 according to draft ROSCP, but not sure which).

4.3.3 Industry Initiatives

The costs of maintaining large stockpiles of oil spill response equipment are prohibitive for most governments, especially in the developing world. In recognition of this, a number of stockpiles of equipment have been established around the world, some by intergovernmental organisations and others by the oil industry. The latter include OSRL (UK-based with world-wide capability), EARL (Singapore) and the Fast Oil Spill Team (based in France and covering the Mediterranean and West Africa)

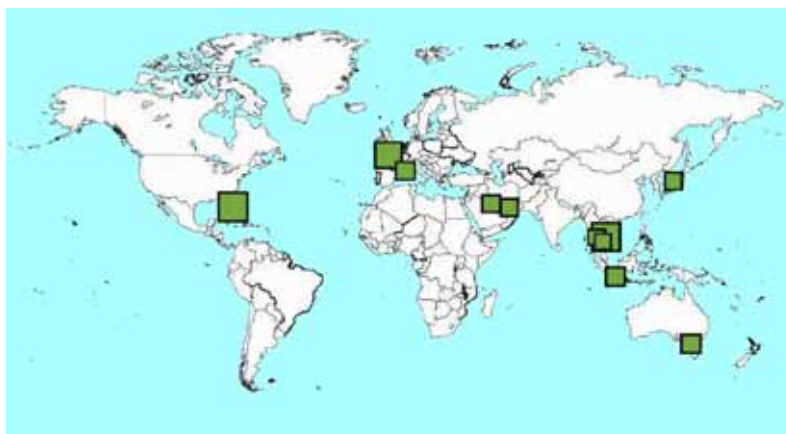


Figure 19: Location of Oil Spill Response Equipment Stockpiles

There are various conditions attached to using these stockpiles, with preference being given to shareholders. Where third parties request access, agreements are required to be in place prior to mobilisation. Charge out rates are also higher for non-Members, but, provided the country is Party to the relevant liability and compensation conventions, these costs should be covered.

4.3.4 Regional arrangements

The objective of the Protocol concerning Co-operation in Combating Pollution in Cases of Emergency in the Eastern African Region is to facilitate the development of regional arrangements for the effective combating of major spillages of oil or other harmful substances from ships. Obligations in terms of the Protocol include:

- the development of national contingency plans and pollution response capabilities;
- the distribution of information to the other Parties regarding their national organization and their competent national authorities,
- informing the other Parties of all pollution incidents,
- the provision of assistance to a Party which so requests.

Although it was adopted in 1985, there has been no attempt to operationalise it until recently, when a draft Regional Contingency Plan was developed under the WIO Marine Highway Project (dated 26/07/2010).

According to the draft plan: “The purpose of the Regional Contingency Plan is to establish, within the framework of the Emergency Protocol and according to the obligations of the Contracting Parties under this Protocol, a mechanism for mutual assistance, under which the competent national Authorities of the countries concerned will co-operate in order to co-ordinate and integrate their response to marine pollution incidents either affecting or likely to affect the territorial sea, coasts and related interests of one or more of these countries, or to incidents surpassing the available response capacity of each of these countries alone.

The general objective of the Plan is to organize a prompt and effective response to accidental marine pollution affecting or likely to affect the area of responsibility and/or the area of interest of one or more of the countries concerned and to facilitate the co-operation in the field of marine pollution preparedness and response.”

The plan also envisages the establishment of a Regional Coordination Centre (RCC) for Marine Pollution Preparedness and Response in the Western Indian Ocean. The Centre will act as the Secretariat for the plan and be responsible for its ongoing maintenance. There are, however, some legal and logistical difficulties related to the implementation of this objective.

4.4 National contingency plans

Regardless of international or regional assistance, effective response to an oil or hazardous substance spill requires a national plan to be in place. South Africa, which has been subjected to numerous oil spills, has had oil spill contingency plans in place since 1983/4. The island countries of the Western Indian Ocean region - Comoros, Madagascar, Mauritius, and Seychelles – prepared and tested national oil spill contingency plans as part of the implementation of the GEF-financed Western Indian Ocean Oil Spill Contingency Planning Project (1998 - 2004), and one of the outputs of the WIO Marine Highway project is national contingency plans for Kenya, Mozambique and Tanzania. In addition, the NOSCPs for the island nations are being updated. According to a report on the implementation status of this project (dated

October, 2010), drafts of these plans had been completed and were expected to be finalised by June, 2011 – although it is noted that the project completion date has recently been extended to December, 2012.

4.4.1 Comoros

A National Oil Spill Contingency Plan for the Union of Comoros was completed in 2003 through the Regional Oil Spill Contingency Planning Project and is currently being updated under the auspices of the WIO Marine Highway Project.

The 2003 plan acknowledges the threat of oil spills from the exploration, production and transport of hydrocarbons - particularly during the cyclone season - and the potential for serious impacts on the fragile natural coastal resources and the economic, ecological and social consequences thereof. It is applicable to the whole of the territory of the Union of Comoros, including the territorial waters and the Exclusive Economic Zone.

The NOSCP defines the administrative and technical organization for response to spills at sea and on the coastline. It also identifies the organisations that will be involved in the implementation of the Plan and defines their roles and responsibilities. It includes a number of Annexes which provide supporting information including a number of maps indicating sensitive areas.

In terms of the NOSCP, the National Coordinating Committee ("CNC") is responsible oil spill response, including preparatory activities as well as training and exercises. It has a core membership made up of:

- A representative of the presidency of the Union
- Two representatives of each island, including representatives of the local coordination committees
- The representative of the Armed Forces
- The representative of the Ministry of Foreign Affairs
- The representative of the Ministry responsible for the Environment
- The representative of the Ministry of the Budget and Finance
- The representative of the Ministry of Internal Security
- The representative of the Ministry of International Transport
- Ministry responsible for the Fishing.

The CNC is chaired by the representative of the Presidency of the Union and meets on an annual basis. The National Coordinator – the representative of the Ministry of Environment - is the convener and provides the secretariat. He is also responsible for implementation of the plan during crisis situations.

4.4.2 Kenya

Kenya has a draft National Marine Oil Spill Contingency Plan (dated October, 2007) designed to assist the Kenya Maritime Authority and other relevant Kenya Government authorities to deal with oil spill emergencies likely to occur within the Exclusive Economic Zone of Kenya. The plan was produced by a team of experts under the National Oil Spill Response Contingency Plan Working Group (NOSRCPWG) including representatives of the oil industry, the oil refinery, the shipping industry, bunkering services and government agencies dealing with wildlife, maritime activities and environmental conservation. These include the Kenyan Navy, Kenya Ports Authority, Kenyan Wildlife Service, Kenya Marine Fisheries Research Institute, the FD and Local Government Authorities.

The plan establishes an Oil Spill Response Action Team (OSRAT) which, in the event of a Tier 3 spill, is responsible for managing the response until such time as international assistance arrives. In addition, it establishes an Incident Command Team led by a National On-Scene Commander. The national plan also requires operators handling crude oil and petroleum products to maintain a Tier 1 response capability within their installations, while the KPA is required to maintain a Tier 2 oil spill response contingency plan for responding to oil spills occurring within the ports of Kenya.

Kenya also has sensitivity maps in the form of KenSea: Environmental Sensitivity Atlas for Coastal Area of Kenya (Tychsen, 2006) (available at www.geus.dk). Recently KMFRI has produced a GIS database showing the oil spill sensitivity indices.

4.4.3 Madagascar

The National Oil Spill Contingency Plan for Madagascar (marked final, but undated) outlines the administrative and technical organization including lead entities and their roles, and procedures for oil spill response. It establishes a Body for Combating Oil Pollution (l'Organe de Lutte contre la Pollution par Hydrocarbures, OLP) which comprises the Minister of Environment, representatives of the Ministry of Finance and the Budget, the Ministry of the Interior, the Ministry of Maritime Transport, the Ministry of Defence, and a National Coordinator. The National Coordinator is the convener and provides the secretariat, and acts as the leader during a crisis.

The National Plan is supported by Provincial (Toamasina, Mahajanga, Antsiranana, Toliary, and Fianarantsoa) regional (Tolognaro and Manakara), and a local plan for the Island of Sainte Marie as well as industry plans at the implementation/operational level.

The OLP meets at least once a year, to approve an annual program of activities based on its responsibilities which include:

- Regular updating of the Plan, including the result of exercises or lessons learned from actual incidents
- Ensuring the preparation and updating of provincial plans, port plans and plans for oil-handling facilities;
- Ensuring the preparation and updating of maps of sensitive areas, including the definition of the priorities of protection
- The development of a national policy for the use of dispersants in Malagasy waters
- The identification of possible sites for storage and disposal of wastes
- Monitoring of technological developments in oil spill response in order to advise the State and the Provinces
- Planning and implementing a program of training and exercises.

Shell Madagascar also has an Emergency Response Plan (dated February, 2008). This is intended to provide support to existing plans in cases where a Shell Madagascar product is involved.

4.4.4 Mauritius

The Ministry of Environment in Mauritius initiated the development of a National Oil Spill Contingency Plan some 20 years ago and is responsible for its implementation. The NOSCP is treated as a live document, and is updated on a regular basis with the most up-to-date version being available on the following website:

<http://www.gov.mu/portal/sites/ncb/eurd/oil/default.htm>

An update is currently underway under the WIO Marine Highway Project and should be available by the end of 2011.

According to the plan:” Part V of the Environment Protection Act 2002 (EPA 2002) provides for contingency plans to cater for spill and environmental emergencies.

The National Competent Authority responsible for oil pollution preparedness and response is the Department of Environment (DOE). The DOE is also the focal point for receipt and transmission of oil pollution reports. The DOE is entitled to act on behalf of the state to request or provide assistance as required, following approval of the Prime Minister's Office.

A National Coordination Committee has been set up in the Ministry of Environment to be responsible for the development, implementation, review and update of the National Oil Spill Contingency Plan. This Committee comprises of representatives of various Ministries, the Mauritius Ports Authority and the Oil Companies and is chaired by the Permanent Secretary, Ministry of Environment.” The plan is tested on an annual basis, with the last exercise having taken place in September, 2010.

The website also houses copies of the coastal sensitivity maps (originally developed in 1989) as well as the Oil Spill Contingency Plan for Port Louis developed and maintained by the Mauritius Maritime Authority.

4.4.5 Mozambique

Oil spill response in Mozambique is the responsibility of the Ministry of Transport and Communications. A draft National Oil Spill Contingency Plan dated 2007 was prepared under the auspices of a Working Group representing government, NGO's and the oil industry.

The plan establishes an organisational structure comprising an Emergency Committee, an Advisory Technical Committee, a Support Group, an Operations Coordinator and various Response Groups. It also outlines the composition of each group and their roles and responsibilities.

The Emergency Committee is composed of representatives of:

- The Ministries of Transport and Communications (MTC), Coordination of Environmental Affairs, Foreign Affairs, State Administration, National Defence, Interior, Mineral Resources, Fisheries, Health, Tourism and Finance.
- The National Institute for Management and Combat of Natural Calamities
- Eduardo Mondlane University
- Mozambique Oil Companies Association
- Public and Private Companies related to Maritime Traffic
- Representative of ship-owners of merchant ships
- Association e of ship-owners of fishing vessels
- Mozambicans NGOs

- Municipalities

The Committee is chaired by MTC through INAMAR. Response operations are lead by the Operations Coordinator.

The NOSCP is supported by a number of Local, Provincial and Zonal plans. Port Authorities are responsible for spills within the ports, while local authorities are responsible for shoreline cleanup (ITOPF, 2006).

4.4.6 Seychelles

Seychelles completed a NOSCP in 2003 under the Regional Contingency Planning Project. However, a workshop was held at the Seychelles Ports Authority under the auspices of the WIO Marine Highway Project in May, 2010 to speed up the process of drawing up a new national oil spill contingency plan, updating the risk analysis, reviewing the national policy on dispersant use, and updating sensitivity maps amongst others. Attention was also given to ensuring that all product handling companies and operators develop contingency plans consistent with the national plan.

According to the 2003 plan, Regulation S.I 28 of 2001 under section 245 (2) of the Merchant Shipping Act states designates the Seychelles Coast Guard as the competent authority for the NOSCP. As such, their responsibilities include the preparation and ongoing updating of the national contingency plan and response to an oil pollution incident. Operators of oil storage facilities are expected to respond to spills from their facilities.

The organisational structure comprises a Unified Command System under the leadership of the Emergency Response Director (Chairman of the National Disaster Committee). Members of the Unified Command include the Commanding Officer of the Seychelles Coast Guard, the Principal Secretary of the Ministry of Environment, the Commissioner of Police and the Director General of the Port and Marine Services Division. Under their command is the On Scene Coordinator supported by various operational divisions. The On Scene Coordinator is selected from the Ministry of Environment for Land base Spills/Shoreline Cleanup and from the Seychelles Coast Guard for Marine Spills.

The NOSCP also lists sensitive areas and refers to a sensitivity map. Two areas of major concern are:

- Aldabra Atoll - a World Heritage Site comprising a coral island of reef located over 600 nautical miles from the main island of Mahe. The location is in close proximity to the Mozambique Channel where there is intense traffic of petroleum products (both crude and refined).
- The Ste. Anne Marine National Park which consists of five islands (Ste. Anne, Moyenne, Cerf, Long Island and Round Island) and the surrounding water areas where there are several coral reefs. The park is in close proximity to the main Port of Victoria and the shipping channel. A vessel casualty within the channel or an incident within the port itself would likely impact the Marine Park within 1-3 hours.

4.4.7 Somalia

Somalia does not have a National Oil Spill Contingency Plan.

4.4.8 South Africa

The responsibility for oil spills emanating from maritime incidents in South Africa is shared between the South African Maritime Safety Authority (SAMSA /DoT) and the Department of Environmental Affairs and Tourism (DEAT – now DEA), with the former being responsible for prevention, and the latter for combating of oil spills. Both departments have some responsibility for contingency planning and there is a tiered approach to the plans.

SAMSA completed a National Oil Spill Contingency in 2005. This is an overall plan setting out the policy on oil spill response, including organisational arrangements, prevention and response strategies. It provides an overview of the actions to be taken by the primary roleplayers as well as other parties concerned in preparation for, and in the event of, an oil spill, and inter-relates these activities with those described in other plans. It also deals with the control of shipping casualties.

DEA's responsibilities included the preparation and maintenance of Coastal Sensitivity Maps and Local/Coastal Oil Spill Contingency Plans to guide the coordination and implementation of coastal protection and clean-up measures during oil spill incidents. The Sensitivity Atlas was published in 1984, while the plans were originally developed in 1986 in consultation with Local and other Authorities having jurisdiction over parts of the coastline. These plans are currently in the process of being updated.

DEA also developed a policy on the use of dispersants, an updated version of which was published as a Marine Notice in 2009, and are responsible for conducting exercises.

In addition, installations such as offshore oil tanker discharge facilities, oil exploration and exploitation sites, power stations, ports, harbours and yacht basins (where bunkering facilities exist) are also required to have contingency plans in place. In this case, it is up to the operator of the facility to develop the plan, although it should be approved by the relevant authority.

A contingency plan to deal with the protection, collection and re-habilitation of seabirds threatened or affected by oil is also in place.

4.4.9 Tanzania

Tanzania has a National Marine Oil Spill Response Contingency Plan (January, 2010) which has been reviewed and tested at a number of workshops over the past few years (in Bagamoyo, 2003 and Dar es Salaam, 2008). The responsible authority for its development, maintenance and implementation is the Surface and Marine Transport Regulatory Authority (SUMATRA), which falls under the Ministry for Infrastructure Development.

The NMOSRCP:

- establishes an organizational structure;
- assigns the responsibility for various tasks to relevant government and non-governmental agencies;

- establishes a framework within which the government coordinating authority and participating agencies shall cooperate to facilitate the operational aspect of oil spill surveillance and response; and
- promotes the development of local plans in the major ports and harbours, refinery plants and oil companies to respond to such incidents.

The organisational structure comprises:

- A National Marine Oil Spill Coordinating Committee (NMOSCC) which includes representatives from all governmental bodies with an input to marine pollution response and, by invitation, such other sectors of the economy, who are likely to be affected by such pollution;
- A Maritime Rescue Coordination Centre (MRCC) which is the focal point for the receiving of all reports on accidents and pollution of the sea and which is responsible for the operational response to accidents at sea which have caused or are likely to cause marine pollution;
- An Environment Strategy Group (ESG) which advises on environmental aspects and public health impacts of the incident and associated response operations both real and potential.

The National Environmental Management Council (NEMC) has overall responsibility for environmental issues within Tanzania with marine responsibilities lying within its Integrated Coastal Management Unit. NEMC is the custodian of the environmental sensitivity atlas for Tanzania and in the event of a pollution incident NEMC provides information and expert analysis to the MRCC via the ESG.

The plan specifically covers spills from shipping casualties as well as from offshore installations, spills within ports and harbours, response and clean-up operations at sea and on the shoreline.

5. Marine Pollution Monitoring

Monitoring is a crucial component of managing marine pollution as shown in the diagram below (adapted from Taljaard et al, 2006). It can include monitoring of pollution sources (for purposes of compliance and quantification), as well as monitoring of a variety of physical, chemical and biological parameters in the receiving environment. It enables managers to assess whether environmental quality objectives are being met or whether the management measures need to be adapted to be more effective. By implication, this approach thus also requires the establishment of such objectives – in this context, marine water and sediment quality objectives.

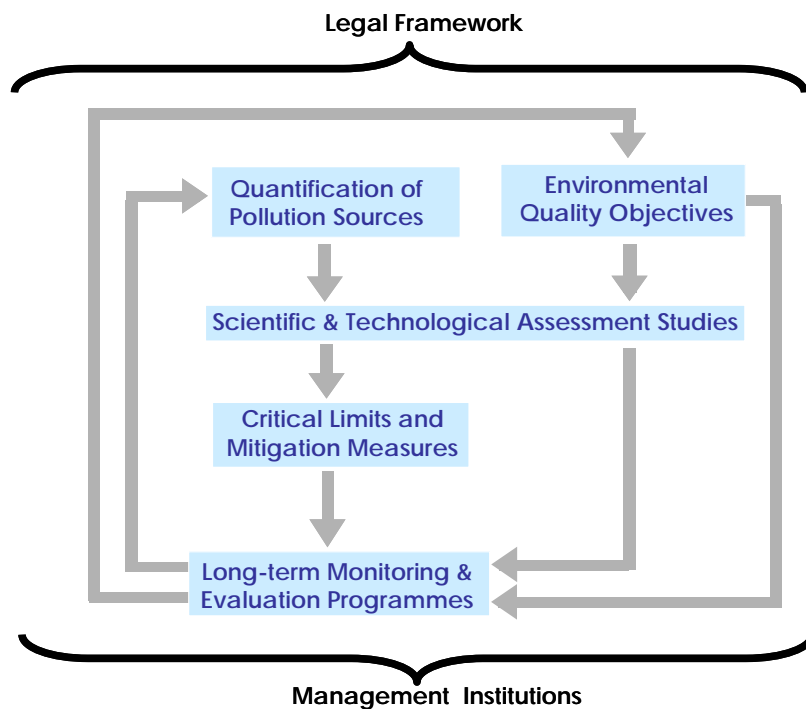


Figure 20. Marine pollution management framework

The monitoring of the receiving environment does not distinguish between pollutants from different sources which may include inputs from land-based activities, dumping or marine sources such as shipping or offshore mining activities. However, a monitoring programme should as far as possible include the monitoring – or the maintenance of records of disposal (eg. for dumping) – of all sources. In the case of marine sources this should include surveillance for oil spills from shipping and/or offshore activities.

5.1 Marine environmental quality objectives in the ASCLME Region

A review of water and sediment quality guidelines in the region was undertaken during the WIO-Lab Project. This indicated that Madagascar, Mauritius and South Africa have such guidelines in place. An updated version of the relevant tables from the draft WIO-Lab Regional Synthesis Report (UNEP/NCS, CSIR and WIOMSA, 2009) can be found in Annex 8.2.

The Strategic Action Plan for WIO-Lab (UNEP/NCS, 2009) sets an objective for water quality in the region namely, that it should meet international standards by the

year 2035, although it also proposes the establishment of “regionally acceptable effluent and water quality standards.”

5.2 Marine water quality monitoring in the ASCLME Region

The WIO-Lab Project also undertook an assessment of national Marine Pollution Monitoring in the region as well as the capacity for such monitoring (including the availability of appropriate laboratories and equipment (de Mora, 2006). The general conclusions of this assessment were:

- None of the countries in the region has a comprehensive national marine pollution monitoring programme with most monitoring that does take place being linked to specific projects or sites (eg. outfalls);
- Sampling and analytical equipment is only available in some countries and maintenance is problematic;
- Quality control /assurance for the laboratories is limited or non-existent;
- There is over-reliance on universities and students to run monitoring programmes;
- Most studies have been supported by external funding which is unsustainable.

Despite the concerns regarding capacity, the WIO-Lab Project developed an ecosystem-based management framework for marine water quality for the WIO region with long-term monitoring programmes as a key component. This is outlined in the report “*Towards a Protocol for Long-term Monitoring of Marine Environmental Quality in the Western Indian Ocean*” (Weerts et al, 2009). It proposes a phased approach, beginning with a basic level monitoring programme which could then be expanded over time. The recommended basic programme is summarised in the Table below:

Table 11: Basic monitoring programme recommended for WIO-Lab countries.

Priority parameters	Parameter	Media	Basic Programme	Sample sites	Sampling frequency
Microbiological contaminants	Enterococci, <i>E. coli</i> , faecal coliforms	Water	Immediate	Recreational, mariculture, shellfish collection areas	2 weeks
	Salinity				
	Temp (°C)	Water	Secondary		
	Turbidity (NTU)				
Trace metals	Full set of appropriate metals	Biological tissues (bivalves)	Immediate	Hotspots and reference sites	6 months
Trace metals	Full set of appropriate Metals + Al & Fe to act as normalisers	Sediment	Secondary		
Persistent organic pollutants	As appropriate	Biological tissues (bivalves), sediment	Medium-term		
Oils (hydrocarbons)					
Litter	Volumes collected during cleanup programmes		Medium-term	Litter hotspots	1 year,

During the project, a pilot monitoring programme was implemented by participating countries. This provided a first estimate of the pollution in perceived hotspots of pollution in the region based on a common methodology. The Category 1 hotspots identified by this programme are listed in Table 12 below (after Table 4-1 of the TDA).

Of particular relevance to this report is that many of these hotspots are in and around ports. Even in Seychelles, which did not have any Category 1 hotspots, Port Victoria was amongst the most contaminated areas (Category 2).

Although the SAP does not specifically mention the monitoring programme, it is implied in as much as the development of regional marine water quality standards and guidelines are.

More detail on monitoring in the individual countries is provided in Section 5.4 below.

Table 12: Category 1 Hotspots as identified in the WIO-Lab Pilot Monitoring Project

Country	Hotspot	Pollution issues
Comoros	Moroni Port	Microbial contamination, nutrient enrichment, marine litter, chemical pollution.
	Anjouan Port	
Kenya	Mombasa	Microbial contamination, nutrient enrichment, marine litter, suspended solids & chemical pollution.
	Lamu inshore waters	
	Malindi Bay & Sabaki Estuary	
Madagascar	Port de Mahajanga	Microbial contamination, nutrient enrichment, chemical pollution.
	Port de Nosy-be	
	Toliara	Microbial contamination, nutrient enrichment, suspended solids.
	Bay de Diego	Nutrient enrichment, chemical pollution.
Mauritius	Pointe Aux Sables to Bay du Tombeau (through Port Louis)	Microbial contamination, nutrient enrichment, marine litter, suspended solids.
	Belle Mare/Palmar	Microbial contamination, nutrient enrichment.
Mozambique	Maputo Bay	Microbial contamination, nutrient enrichment, marine litter, suspended solids & chemical pollution
Seychelles	None	
South Africa	Durban	Microbial contamination
Tanzania	Dar es Salaam	Microbial contamination, nutrient enrichment & chemical pollution
	Tanga	Microbial contamination, nutrient enrichment
	Zanzibar	

5.3 Surveillance for oil spills

As far as can be ascertained, South Africa is the only country in the region with an active surveillance programme for oil spills at sea. This is carried out by an aircraft under contract to the Department of Environmental Affairs. The current contract makes provision for 45 hours flying time per month with an option to increase this to 60 hours. This ongoing surveillance is focussed on the shipping lanes although the

contract also makes provision for reconnaissance flights during incidents as well as ad hoc flights for other purposes eg. research¹⁸.

Munga et al (2006) reported that the responsibilities of the Kenyan Navy include the patrolling of Kenyan waters, while those of the Oil Spill Mutual Aid Group (OSMAG) under the Ministry of Transport and Communications include overseeing oil spill surveillance. However, no evidence was provided to suggest that there is an active surveillance programme.

In Mozambique, the Marine Arm of the Ministry of National Defence is responsible for surveillance of the maritime area, although other institutions such as the Police, Fisheries and Maritime Authorities, also play a role in surveillance activities (Gove, 2011).

Similarly, in terms of the Maritime Zones Act, 1977, the Seychelles Coast Guard is responsible for surveillance in the EEZ. This includes oil spill surveillance although the Coast Guard have no planes and have to utilise the planes from the IDC (Island Development Company) (Nageon, 2011 and *pers. comm*).

It is understood, however, that the WIO Marine Highway project has recently been in discussions with the European Space Agency who are undertaking a sophisticated satellite imagery programme of the project area which could assist in the detection of oil spills and generally monitor the main shipping route.

5.4 National Field Monitoring Initiatives

5.4.1 Comoros

According to the IAEA report (de Mora, 2006) the Comoros has no national marine pollution monitoring programme and no experience in the analysis of relevant pollutants with the exception of microbial contaminants. It is unclear to what extent the pilot monitoring programme under WIO-Lab was implemented, although two hotspots were reported as confirmed.

5.4.2 Kenya

The mandate for marine pollution monitoring in Kenya lies with KMFRI although as of 2006, there was no national monitoring programme (de Mora, 2006). They have, however, undertaken some project-funded monitoring involving a variety of parameters in water, sediments and biota.

5.4.3 Madagascar

The Ministry of Environment is responsible for monitoring of the marine environment, but there is no national marine pollution monitoring programme. However, Madagascar does undertake a limited amount of externally funded, project-based monitoring. For example, the Norwegian Development Agency was reported to be funding microbiological and chemical monitoring programmes in the Bays of Toliara and Fort-Dauphin (de Mora, 2006) in collaboration with the Institut Halieutique et des Sciences Marines (IHSM) and the Centre National de Recherches sur l'Environnement (CNRE). Both of these institutions are reasonably well equipped although their experience is limited to water samples and does not include sediments or biota.

¹⁸ Y. Petersen, *pers. comm.*

CNRE also participated in the WIO-Lab pilot monitoring of pollution hotspots (Mahajanga and Nosy-Be) as the lead institution for Madagascar. It was noted that both of these hotspots are located close to areas of offshore oil exploration.

5.4.4 Mauritius

According to de Mora (2006), the responsibility for monitoring in Mauritius appears to be split amongst a number of organizations:

- The Central Water Authority monitors, amongst others, industrial effluent discharges including some which discharge close to river mouths;
- The Waste Water Laboratory monitors the wastewater which is discharged by the four ocean outfalls in Mauritius;
- The National Environment Laboratory, which is part of the Department of Environment, has a mandate to “investigate” all environmental media, including marine, but their role is described as “troubleshooting” rather than monitoring;
- The Albion Fisheries Research Centre – which carries out the research, development and management functions of the Ministry of Agro Industry, Food Production and Security - runs a water quality monitoring programme. Samples are taken at the mouths of the main estuaries every two to three months, while bathing water quality is measured on a monthly basis.

Despite – or perhaps because of – the numerous organizations involved, there is no comprehensive national monitoring programme, there is some duplication, the parameters being measured are limited primarily to nutrients and microbial indicators, and samples are limited to water and do not include sediments or biota.

The National Environment Laboratory was the lead institution for the pilot monitoring programme under WIO-Lab, although a number of laboratories participated.

More recent information from the ASCLME National Focal Point indicates that Mauritius has a number of monitoring programmes, some of which are as reflected above, although others appear to be new. The list includes:

- I. Lagoonal Water Quality Index programme - Ministry of Environment & Sustainable Development (National Environment Laboratory)
- II. Lagoonal monitoring programme for Port-Louis region - Ministry of Environment & Sustainable Development (ICZM Division)
- III. Independent Environment Audit on Wastewater Projects - Ministry of Environment & SD (Pollution Prevention and Control Division)
- IV. Monitoring programme for wastewater effluents from industries, hotels and wastewater treatment plants – Wastewater Management Authority
- V. Monitoring programme for coastal water quality and ecosystem – Ministry of Fisheries & Rodrigues (Albion Fisheries Research Centre)

5.4.5 Mozambique

The responsibility for environmental monitoring in Mozambique lies with the Ministry for the Coordination of Environmental Affairs (MICOA), but they do not have the required operational capacity and there is no national monitoring programme. The National Laboratory of Food and Water Safety (NLFWS) run a water quality programme but it is primarily focused on freshwater and analyses marine samples

only on an occasional basis (de Mora, 2006). Despite the relative lack of expertise in marine assessments, the NLFWS was the lead institution for Mozambique's participation in the pilot monitoring programme under WIO-Lab.

5.4.6 Seychelles

The Seychelles was not included in the IAEA/WIO-Lab assessment of monitoring capacity, but the country participated in the pilot monitoring programme through the Seychelles Bureau of Standards.

5.4.7 Somalia

Somalia did not participate in the WIO-Lab assessment, and there is currently no monitoring taking place there.

5.4.8 South Africa

Although South Africa does not have a national marine pollution monitoring programme as such, a recent review of monitoring initiatives undertaken as part of the National Programme of Action on Land-based Activities revealed a total of 55 recent (from 2000) monitoring initiatives of which 29 fall within the ASCLME Region. 26 of the total number are coastal programmes and 29 focus on estuaries. 35 (64%) are ongoing monitoring initiatives while 20 (36%) are past monitoring initiatives that are either short-term or once-off programmes (James and Paterson, 2010).

The majority of coastal monitoring programmes are ongoing and are linked to specific discharges to the offshore marine environment (offshore outfalls), ports, bays or bathing beaches. Apart from the latter which are focussed on microbial contaminants, the programmes cover a fairly comprehensive range of parameters and may include samples of water, sediments and biota. Those for outfalls are undertaken as a part of the permit conditions. In contrast to the above, only a third of the estuarine monitoring programmes are ongoing, many as part of municipal monitoring initiatives.

The responsibility for a national monitoring programme lies with the Coasts and Oceans division of the Department of Environmental Affairs. However, the permits for most outfalls are issued by the Department of Water Affairs (although this may change in terms of new legislation), and most of the field monitoring for these is undertaken by the CSIR. The CSIR was also the lead institution for the pilot monitoring programme under WIO-Lab.

In addition to the above, the Department of Environmental Affairs initiated a Mussel-Watch Programme in 1985 to monitor the heavy metal concentrations in the tissues of the Mediterranean mussel (*Mytilus galloprovincialis*) at 42 sites in the Western and Northern Cape. The programme was expanded to Durban and East London in 2004 (<http://soer.deat.gov.za>) and it is understood that it is still being implemented.

5.4.9 Tanzania

The responsibility for monitoring in Tanzania lies with the National Environment Management Council (NEMC). While there is no national monitoring programme, where analyses are required, they are generally contracted out to the University of Dar es Salaam. The Institute of Marine Sciences in Zanzibar (which is part of the University) also has some capacity (de Mora, 2006).

To date, the majority of work undertaken has been relatively short-term and linked to externally funded projects. Ferletta *et al.* (1996), for example, conducted baseline studies on the accumulation of heavy metals in algae as indicators of pollution in marine water at Dar es Salaam and Zanzibar. A comparison of the results from 1989 and 1994 revealed a significant increase in heavy metal concentrations.

The Institute of Marine Sciences was the lead institution for the pilot monitoring conducted under WIO-LaB in 2007. The monitoring included five sampling stations in Dar es Salaam and four in Zanzibar – the identified hotspots. This indicated that some areas around Dar es Salaam had concentrations of copper in sediments well above the guideline value recommended for the WIO region (Mohammed *et al.*, 2008).

6. Conclusions and recommendations

Deteriorating quality of the coastal waters of the ASCLME region poses a significant threat to public health as well as to the health of its living marine resources and ecosystems – and thus also to the economy to which fisheries revenues, for example, contribute US\$943 million annually (ASCLME). The sources of pollution which contribute to this deterioration include land-based, marine and maritime activities.

Land-based activities were the focus of the WIO-LaB project which concluded that:

- “.. the highest pollutant loads entering the WIO originate from the mainland states and Madagascar” with pollution being concentrated in a number of hotspots in and around the main urban centres;
- the most common problems included microbiological contamination, suspended solids, chemical contaminants, litter and solid waste and high nutrient levels leading to eutrophication;
- land-based sources – such as domestic and industrial effluents and runoff from urban and agricultural areas - contribute a significant amount of the pollution load to the WIO.

While there is insufficient information for a thorough analysis of the situation in this region, it is generally accepted globally that pollution from land-based activities comprises between 80 – 90% of the pollution load. Nevertheless, marine and maritime sources such as dumping, shipping, ports, and oil and gas activities can make a significant contribution to local and transboundary pollution, and were the focus of this review.

6.1 Pollution from Marine Sources

The general conclusion of this study is that there is a lack of detailed information available on marine sources in most countries in the ASCLME region. This is linked to the fact that the sources are not being adequately managed either because there is limited or no legislation or there is a lack of technical capacity – or both. In addition, there is limited cross-sectoral co-operation and in some cases duplication of mandates.

Despite the general lack of data, the types of pollutant from marine sources likely to be of particular concern include:

- Litter from vessels, offshore rigs and port activities;
- Petroleum hydrocarbons from shipping, port operations and offshore oil and gas activities (including accidental and operational discharges);
- Tributyltins (TBT's) and other toxic constituents from anti-fouling coatings on vessels and submerged infrastructure;
- Heavy metals and other toxic contaminants (eg. pesticide residues) which accumulate in, for example, port sediments and which may then be discharged into other coastal areas after dredging operations;
- Noise pollution associated with seismic surveys used in oil and gas exploration;
- Suspended solids, accumulated deposits, antibiotics, heavy metals and other toxic constituents associated with the drilling muds used and/or produced water arising from offshore oil and gas exploitation;

- Microbiological pollutants and organic matter arising from sewage and garbage discharges from vessels and drilling rigs/platforms, particularly if they are located in shallow water and/or semi-enclosed areas where water circulation is limited.

6.1.1 Dumping

There is a limited amount of dumping (as defined in the London Convention/Protocol) taking place in the region. However, although for the most part there are no detailed records, it is highly likely that ports in all countries undertake dredging on a reasonably regular basis and that many of them are dumping the dredged material at sea. Since many of the pollution hotspots identified by WIO-LaB were in and around ports, it is likely that this material is contaminated. Nevertheless, despite the fact that four of the countries are Party to the London Convention and/or Protocol, it appears that only South Africa is managing the disposal thereof. This is of particular concern in the context of current and planned port expansions which are taking place across the region. In addition, the definition of dumping also includes the abandonment or toppling of platforms or other man-made structures on site for disposal purposes. In light of the expanding offshore activities, this may become an issue in the future.

A related concern is that there is a lack of understanding of the concept of dumping under the Convention and it appears that it is confused with the illegal dumping of, for example, solid waste in coastal areas.

A further issue is that of alleged illegal dumping of hazardous waste off the coast of Somalia which is potentially a threat to the region as a whole.

6.1.2 Shipping

Information on shipping traffic at the regional level is available through the WIO Highway Project and the UNCTAD review of Maritime Transport (2005), although both these reports are somewhat out-dated. Data at the national level was limited for most countries, and where information was available it consisted in most cases of the number of vessels visiting ports and/or volumes of goods imported or exported by ship. Nevertheless, it can be concluded that shipping activity in the region is increasing – as can be inferred from the plans for port expansion in many of the countries.

There also appears to be a general lack of information on shipping incidents and the pollution emanating therefrom – although there is information on incidents involving piracy. While only one major oil spill has occurred in the region (the Katina P off of Maputo in 1992), the cumulative effects of smaller spills can have impacts which are as, if not more, significant. It was anticipated that such information would be available from the IMO database on shipping casualties and/or the maritime authorities in the countries. However, the IMO database relies on reports from the countries, and in the majority of cases there are either no reports, or reports which provide minimal information.

6.1.3 Port Activities

Ports are at the interface between maritime and land-based activities. They are generally located in urban areas and in many cases on rivers. As a result, there are generally a variety of effluents and contaminated runoff discharging into port waters from land-based sources. At the same time, bunkering of vessels, offloading of fuel and chemical cargoes, disposal of garbage and other waste from vessels, and ship-

building, maintenance and repair – as well as shipping accidents and abandoned vessels in ports - also contribute to high levels of pollution in ports.

Most ports in the ASCLME region lack adequate reception facilities for calling vessels. Thus, while there was limited or no direct information on pollution in ports for most countries, it is highly likely that there is illegal disposal of ship generated wastes in and around the ports, and it is significant that the majority of the pollution hotspots identified by the WIO-LaB project are in or adjacent to ports.

Looking at ports in the broader context, they are also the entry points for imported goods – including illegal hazardous wastes. While these may not necessarily be a direct threat to the marine environment, any initiative aimed at enhancing environmental management capacity in ports should also address the lack of capacity for detecting and handling illegal shipments.

6.1.4 Offshore oil and gas

Offshore oil and gas activities are expanding in most of the countries in the region. To date there do not appear to have been any major pollution incidents. On the other hand, the cumulative effects of numerous smaller incidents and operational discharges could be significant especially as the number of wells grows. Moreover, there could be a growing number of platforms in the area. There is thus potential for conflicts with fisheries interests, not only due to pollution but as a consequence of habitat degradation and physical exclusion from drilling areas and abandoned rigs. At the same time, it is likely that the capacity to manage these activities is limited. In addition, since many of the companies involved are international, there may be problems of accountability.

6.2 Integration of ASCLME activities on marine pollution with other initiatives in the region

There are a variety of other programmes and organisations working in the ASCLME region, some of which include marine pollution components. The fact that the ASCLME has been tasked with coordinating the development of an LME-wide TDA and SAP (Report on Joint Stocktaking Meeting, April, 2010) is a key opportunity to pull all of these initiatives together.

To date in-depth discussions on collaboration around marine pollution appear to have been largely limited to WIO-LaB. However, the GEF-World Bank project – the Western Indian Ocean Marine Highway Development and Coastal and Marine Contamination Prevention Project, which is being implemented by the Indian Ocean Commission (IOC) and the South African Maritime Safety Authority (SAMSA) – is of particular relevance, while potential organisational partners for collaboration on marine pollution related activities include:

- UNEP Regional Seas – Nairobi Convention Secretariat
- IMO Technical Co-operation Division
- Office of the London Convention/Protocol
- International Ocean Institute of Southern Africa
- WIOMSA
- PENAf (Ports Environmental Network Africa)
- PMEASA (Port Management Association of Eastern and Southern Africa).

Potential areas for collaboration are outlined in the context of the activities which are recommended for inclusion in the SAP.

6.3 Recommendations

6.3.1 Prevention and management of pollution

The management of marine pollution (excluding emergency situations) comprises two main interlinked elements:

- Prevention of pollution (or reduction/minimisation) at source; and
- Setting and maintaining environmental quality standards through ongoing monitoring and adaptive management.

Prevention activities are generally applied at the source of the pollution and are therefore implemented on a sectoral basis. However, the setting of coastal water quality standards and related monitoring requires cross-sectoral coordination to be effective.

6.3.1.1 Prevention

The prevention of pollution from land-based sources is being addressed by WIO-LaB. In terms of marine sources, the prevention of pollution from ships is dealt with at the international level through the IMO's MARPOL Convention. This is supported at the national level by Port state control measures. At present these are not being effectively implemented by all the ASCLME countries, but this issue is being addressed through the WIO Marine Highway project – in addition to contingency planning for response to pollution emergencies.

Aspects which could be addressed under the ASCLME SAP include:

- The management/ disposal of dredged material;
- The prevention of pollution in ports – specifically from shipping and port-related activities;
- The prevention of pollution from offshore oil and gas activities.

These are addressed in more detail below.

6.3.1.2 Setting of standards

WIO-LaB undertook a review of water and sediment quality guidelines in the countries of the region, and the WIO-LaB SAP (and draft PIF) recommends the development of regionally harmonised effluent discharge and water quality standards. The proposed effluent discharge standards will likely be applicable to land-based sources and should be complemented by standards for discharges from marine sources.

Standards for discharges from shipping are covered by MARPOL, and the Annex 1 (oil) regulations specifically state that those for vessels of 400 gross tonnes and above are also applicable to offshore rigs and platforms. Annex V also contains specific provisions regulating the disposal of garbage from such structures. However, there is a need to develop standards for operational discharges from rigs and platforms for substances other than oil. Moreover, an investigation should be undertaken into the need for the establishment of Special Areas and/or Particularly Sensitive Sea Areas in the ASCLME region, in which stricter standards can be

applied to vessels. South Africa, for example, recently applied for, and was granted a Special Area on the South Coast under Annex I (effective 2008).

The development of regionally harmonised water quality standards (proposed by WIO-LaB) should also be complemented by the development of regional sediment quality guidelines (or standards) as well as standards for seafoods – the latter possibly in conjunction with SWIOFP.

6.3.1.3 Monitoring and assessment

In the context of marine pollution, monitoring includes:

- Compliance monitoring – for example, the analysis of effluents to ensure that they meet the required effluent standards;
- Monitoring and surveillance using various remote sensing applications;
- Water, sediment or biota quality monitoring – this comprises analysis of samples taken in the field and is intended to ensure that the established environmental quality objectives are being met.

Monitoring is also important for assessment purposes and can serve to fill gaps in the information base.

As mentioned in Section 5.2, one of the outputs of the WIO-LaB Project was a framework for the management of water quality which included long-term field monitoring as a key component. Moreover, the TDA identified Monitoring and Assessment as one of the key actions for inclusion in the SAP – both to fill information gaps, and to generate the information required for improved management. However, although the SAP recommended the development of effluent and water quality standards (as outlined above), it does not explicitly include any monitoring. This is of considerable concern as none of the countries have national monitoring programmes and setting standards alone does not ensure maintenance of water quality.

On the other hand, the WIO Marine Highway is currently in discussions with EOWorld (on behalf of the European Space Agency) with a view to using satellite imagery for the detection of oil spills potentially for prosecution purposes and the compilation of a database of spills. They also have data on changes in coral reefs.

Moreover, according to the list compiled by the ASCLME PCU, there are a variety of other datasets and/or products which are in the public domain or could be made available through partner organisations. Some of these parameters are pertinent to marine pollution – for example, nitrates, phosphates, oxygen, chlorophyll, incidence of coral disease. Data from the UNESCO-IOC HAB Programme could also be useful in as much as HABs are exacerbated by high nutrient levels resulting from pollution.

It is recommended that a workshop on monitoring is convened with all relevant stakeholders to develop a monitoring programme for the region which includes national and regional elements, an appropriate balance of the various types of monitoring, and which is sustainable in terms of the available financing. The workshop should include a session on financing mechanisms and participants from the public and private sector who have a vested interest in maintaining water quality – for example, the tourism sector and port authorities.

6.3.2 Enhancing Management of Sources

There is scope for improving the management of all marine sources of pollution as outlined below.

6.3.2.1 *Dredging*

Information on dredging activities – and the dumping or disposal of dredged material – in the region is limited. At the same time, it is apparent that dredged material is being dumped into coastal waters in some countries. Moreover, port expansion and/or upgrading are scheduled in many areas over the next few years. In this context – and in light of the hotspots identified by WIO-Lab – it is strongly recommended that a programme to enhance the management of dredging activities and disposal of dredged material should be initiated.

As a first step it is recommended that the ports in all ASCLME countries start keeping accurate records of dredging, in particular the volumes and location of disposed dredged material. In addition, consideration should be given to initiating regular analyses of port sediments – funded by the Port Authorities. This would contribute to the establishment of a long-term monitoring programme.

In addition, a regional training seminar/workshop on dredging and management of dredged spoil should be organised either as a focussed event, or as part of a multi-issue workshop around environmental/pollution problems in ports.

These activities should be implemented under the umbrella of the Nairobi Convention, with other potential partners including the Office of the London Convention/Protocol (OLCP), PENAf (Ports Environmental Network for Africa) and PMAESA (Ports Management Association of Eastern and Southern Africa). The OLCP have indicated their willingness to sponsor, or co-sponsor an event in the region in 2012/13. They are also currently finalizing a low-tech approach to dredged material management (in conjunction with IAPH – the International Association of Ports and Harbours) and would be interested in road-testing it in the region to see how useful and effective it is. This could be launched at the regional workshop.

PENAf, together with Pan-African Ports Conference (PAPC), the continental ports body, have recently launched the African Ports Environment Initiative (APEI) aimed at greening the ports by promoting improved environmental performance among African ports through a collaborative and cooperative approach. The initiative has collaborative arrangements with Ecoports Foundation in Europe for best practice lessons and exchange. PEFAf have also expressed interest in collaboration with ASCLME, both on the dredging and other port-related initiatives.

This initiative could also be the first step towards the development of a Technical Protocol to the Nairobi Convention on the Management of Dredged Spoil (rather than dumping as a whole, which seems to be limited in the region at present) and/or to encourage ASCLME countries which are not yet party to the London Protocol, to join it.

6.3.2.2 *Pollution in ports and harbours*

As mentioned previously, a significant number of the pollution hotspots identified by WIO-LaB occur in and around ports, including the ports of Moroni and Anjouan in the Comoros; Mombasa in Kenya; the Ports of Mahajanga and Nosy-be in Madagascar;

Port Louis in Mauritius; Maputo Bay in Mozambique; Port Victoria in Seychelles; Richards Bay and Durban in South Africa; and Dar es Salaam in Tanzania. However, WIO-LaB only deals with ports in as much as land-based sources of pollution discharge into port waters. It is therefore recommended that ASCLME includes the following activities aimed at addressing marine sources of pollution in and around ports:

- Detailed assessment of regulations pertaining to pollution management in ports and the potential for economic incentives;
- An assessment of the waste reception facilities available in ports in the ASCLME region;
- Based on identified gaps, promote construction of reception facilities for marine debris / wastewater/oil etc;
- Improve on- and off-loading practices to reduce spillage;
- Undertake baseline studies on water, sediments and biota to establish baseline data on the quality of port environments;
- Development of environmental management plans for ports which include contingency plans for pollution emergencies, as well as monitoring and compliance components;
- Education and awareness-raising programme for port users and authorities with a view to building partnerships and stewardship;
- Promote the development of a regional “Code of Practice” for environmental management in the ports of the region.

These activities should be undertaken in collaboration with IMO, PENAf and PMAESA and could include the development of public/private partnerships.¹⁹ It is noted that PENAf is already looking at collaboration with CSIR in South Africa to carry out a state of the environment and develop an environmental profile for the region’s ports under the APEI.

6.3.2.3 Assessment and monitoring of illegal dumping

The illegal dumping of hazardous wastes along the Somali coastline is reported to have started in the early 1980’s and over the years calls have been made to various fora for an in depth investigation into the matter. In 2004 and 2005, for example, Somalian representatives attended a meeting of the Scientific Group of the London Convention/Protocol following which the Parties committed themselves to investigate cases where wastes found dumped in Somali waters were loaded in their ports or transported in vessels registered in their territories or flying their flag. At about the same time, UNEP conducted a rapid assessment of the impacts of the Asian tsunami of December, 2004, including the reported dumping of toxic wastes because the tsunami resulted in a number of containers being deposited on the shore. It recommended a more in-depth assessment of the issues.

The matter was raised again at a meeting in February, 2010 on counter-piracy strategies coordinated by the United Nations Political Office for Somalia (UNPOS) and Department of Political Affairs (DPA). It was subsequently raised in the UN Security Council in the context of discussions on piracy. UN Resolution 1976 (April, 2011) amongst other things:

¹⁹ Activities in the ports should also cover invasive species issues including ballast water discharges and hull-fouling. However, these are not addressed here as they are being dealt with in a separate report.

“..requests the Secretary-General to report within six months on the protection of Somali natural resources and waters, and on alleged illegal fishing and illegal dumping, including of toxic substances, off the coast of Somalia, taking into account the studies on this matter previously conducted by the United Nations Environmental Programme and other competent agencies and organizations, and expresses its readiness to keep the matter under review.”

It is suggested that communications be established with the UN Political Office for Somalia (UNPOS) and/or UNEP on this matter with a view to further discussions on the way forward once the report has been completed.

6.3.2.4 Combating illegal waste shipments

Although the shipment of illegal wastes is not necessarily a source of marine pollution – except perhaps in the case of a shipping accident – the issue should be addressed as part of the initiative to enhance environmental management in ports. Although the shipment of wastes is regulated under the 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal – and, in the case of Africa the 1991 Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa – it is estimated that some 1.5 million containers of illegal waste shipments are cleared through ports annually (Ruessink and Wolters, 2009).

An assessment of the importation of illegal wastes into ports in the ASCLME region needs to be undertaken including a review of existing regulations and compliance monitoring practices. Solutions should be sought in the context of a public-private partnership agreement and in collaboration with PENAf and the Seaport Environmental Security Network (SESN) of the International Network for Environmental Compliance and Enforcement (INECE). SESN aims to strengthen capacity to prevent the importation of illegal waste shipments, to raise awareness of the extent of this illegal trade, and to support co-operation amongst the authorities – national and international – that have responsibilities in ports.

6.3.2.5 Management of offshore oil and gas activities

While there are some regulations under MARPOL which apply to offshore structures, the extent to which these are being applied in the region is unknown although it is likely that it is limited given that offshore activities are not normally regulated by maritime authorities, their location makes monitoring difficult, and, in many cases they are being undertaken by international companies. It is recommended that, in light of the likely expansion of such activities in the region, a more thorough assessment of current management activities is undertaken and recommendations be developed for a regionally harmonised approach. This should include a regional regulatory framework.

In addition, there should be a Strategic Environment Assessment of the cumulative effects of oil and gas exploration and production activities on the ASCLME region. This should be undertaken in collaboration with industry and interested stakeholders with a view to mitigating and minimizing pollution as well as physical alteration, destruction or degradation of habitats.

6.3.2.6 Shipping

Issues related to shipping – including oil spill response and the enhancement of Port state control – are being addressed through the WIO Marine Highway Project. A

specific recommendation though is that efforts should be made to improve the reporting of shipping/oil spill incidents to the IMO for inclusion in their database. Consideration should also be given to the establishment of a regional database – possibly housed by the proposed Regional Coordination Centre.

6.3.3 Legal, Policy and Institutional Reform

The successful management of marine pollution – from land-based or marine sources - requires an effective legal regime covering national, regional and international levels. At present there are a number of gaps and inconsistencies in the legal framework which need to be addressed. Many of these have been identified in the sections above but are consolidated into a summary of proposals on legal reform below.

6.3.3.1 National

Although the National Policy and Governance Assessments in progress under the ASCLME do not explicitly address marine pollution, they have identified a number of generic issues which are relevant to the regulatory framework – in particular, overlapping jurisdictions and a lack of communication across sectors. More specific problems identified included:

- Failure to domesticate the provisions of international conventions even when they have been ratified;
- Even where legislation is in place, the implementation is weak due to a lack of adequate financial, technical and human resources;
- Surveillance activities are split amongst various institutions – this is neither cost-effective nor efficient;
- Maritime borders between some of the countries have not yet been agreed and with the increasing interest in offshore resources, could lead to conflicts.

From a more technical perspective, there is a need to develop national legislation in some, if not all, countries to cover:

- The management of dredging and dredged material disposal (dumping);
- The environmental impacts of offshore oil and gas (and other minerals where appropriate) activities;
- The inclusion of monitoring requirements into permits – for example, for offshore oil and gas activities, dredged material disposal etc;
- Liability and Compensation in the event of a major oil spill from offshore oil and gas activities;
- Standards for seafoods (for toxic compounds and bacteriological)²⁰.

Since the details vary from country to country, national legal and institutional reform programmes would need to be developed to cater for the specific needs of each country. Moreover, the programme should cover policy, legal and institutional issues for the maritime/oceans sector as a whole rather than just marine pollution concerns.

6.3.3.2 Regional

The Nairobi Convention already provides a legal framework for addressing marine pollution issues at the regional level. It contains Articles dealing with pollution from all

²⁰ This aspect was not covered in this review, so an initial step would be to ascertain which countries do not already have such standards in place.

sources – land-based and marine – and has two technical protocols addressing specific aspects of pollution, namely:

- The Protocol concerning Co-operation in Combating Pollution in Cases of Emergency in the Eastern African Region, adopted in 1985. It entered into force in 1996; and
- The Protocol for the Protection of the Marine and Coastal Environment of the Western Indian Ocean from Land Based Sources and Activities adopted in March, 2010. This Protocol was one of the outcomes of the WIO-LaB project, but is yet to enter into force.

There are concerns that the Emergency Protocol is out of date and that it has never been fully implemented although some aspects have and are being addressed through the WIO Marine Highway Project and its predecessor – the Western Indian Ocean Oil Spill Contingency Planning Project. All countries except Somalia have at least basic contingency plans in place and there is a draft Regional Contingency Plan. Discussions have also been held regarding the establishment of a Regional Coordination Centre although it seems that there is as yet no agreement on the location of such a centre. Such a centre would facilitate the exchange of information and communications around oil spill incidents. However, bilateral or multi-lateral agreements to facilitate the provision of mutual assistance during emergencies have yet to be put in place.

Consideration should be given to the development of additional Protocols under the Nairobi Convention to “operationalise” the relevant articles and promote regional harmonisation in the management of marine pollution. These could include:

- A Protocol on dredging/dumping; and
- A Protocol on the management of pollution from offshore activities (this could be broadened to cover all environmental impacts rather than just pollution) and including discharge standards. A precedent for this can be found in the Protocol for the Protection of the Mediterranean Sea Against Pollution Resulting from Exploration and Exploitation of the Continental Shelf and the Sea-Bed and Its Subsoil.

Harmonisation could also be promoted through the development of a Regional Policy on Marine Pollution, supported by the adoption of regional guidelines and or standards for water and sediment quality, standards for seafoods. In addition, it is recommended that Regional Code of Practice for Environmental Management in Ports be developed in collaboration with PENAF and PMAESA.

Finally, there should be an investigation into the need and potential for the development of Special Areas and or Particularly Sensitive Sea Areas under MARPOL in the region.

6.3.3.3 International

All the ASCLME countries are Parties to UNCLOS, and with the exception of Somalia, MARPOL – Including Annexes I and II. Consideration should be given to promoting ratification of Annexes IV (sewage) and V (garbage) by those that have not already done so.

Ratification of oil and HNS related conventions has/is being addressed by the WIO Marine Highway Project, but it is recommended that ASCLME considers including activities to promote the ratification of:

- The Anti-fouling Convention (2001)
- The London Protocol (1996).

6.3.4 Training

A lack of technical capacity has been cited as a significant contributing factor to escalating marine pollution problems in the region. Technical training, especially for government officials, should therefore be an important component of future ASCLME activities. A number of the options that are available in the region and elsewhere are outlined below.

6.3.4.1 Ocean governance

The International Ocean Institute (IOI) has a long history of conducting training and capacity building programmes, of which the most widely known is the annual Ocean Governance course offered by IOI-Canada at Dalhousie University in Halifax. More recently a number of regional Ocean Governance courses have been or are being developed, including one for African countries which is being developed by the Southern African branch of IOI, located at the University of the Western Cape in Cape Town, South Africa.

The course will be held over 4 – 5 weeks, and will be specifically designed to benefit mid-career professionals, educators, researchers and civil society members that have coastal and marine related responsibilities, functions or interests, preferably from countries within the African region. The coursework will be roughly half classroom and half practical sessions with the lectures being complemented by hands-on exercises in the field and case study scenarios aimed at building the analytical skills needed in the various fields being addressed. Trainees will also be expected to complete a project over the period of the course with presentations to be made at a roundtable session in the final week. It is anticipated that it will include the following topics, all of which will be illustrated using case studies/ examples which highlight challenges to the African region:

- Oceans and Coasts: Opportunities and Threats
- Understanding Ocean and Coastal Ecosystems
- Governance Tools (Legal and Technical)
- Putting the Tools to Use
- Providing a Supporting Environment for Management.

Pending the availability of funding, the course material will be developed during 2011/12 with a pilot delivery during 2012. It is recommended that ASCLME provides support for delegates to attend the pilot delivery and/or subsequent deliveries.

6.3.4.2 Marine pollution management

Training and capacity building are at the core of IOI-SA's activities and, in addition to the proposed Ocean Governance course, it already offer a number of short courses based on the Ocean-Learn and Train-Sea-Coast systems. These cover several disciplines of marine and coastal management including the Management of Marine Pollution, a comprehensive course which was successfully delivered to the GCLME countries in February, 2009.

More specific courses – for example, Contingency Planning and Oil Spill Response – could also be offered in collaboration with the IMO's Technical Co-operation Division,

although it is noted that most of the ASCLME countries should have received such training under the WIO Marine Highway Project.

6.3.4.3 Management of offshore oil and gas activities

Oil, gas and mineral exploration and exploitation are expanding in many of the ASCLME countries and in many cases are being led by international companies. There is therefore a need for a thorough understanding on the part of governments in the region of the potential impacts of such activities and the options available to minimise them. While the Marine Pollution Management course mentioned in Section 6.5.2 above includes a Module on the Offshore sector, it is recommended that a more in-depth course be developed in collaboration with IOI-SA and the industry.

6.3.4.4 Management of dredged material

As mentioned above (Section 6.3.2.1), the OLCF have already indicated their willingness to sponsor a regional training seminar/workshop on dredged material management, and their interest in road-testing a recently developed low-tech approach to this.

6.3.4.5 Environmental management in ports

ASCLME should work in collaboration with initiatives such as the African Ports Environment Initiative and the Ecoports Foundation to develop the capacity required to enhance environmental management in ports. This could include providing sponsorship to attend international events – for example, the annual GreenPort environmental conference, of which the next is from 14 – 15 September, 2011 in Hamburg, Germany.

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8 Appendices

8.1 ASCLME National Focal Points

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8.2 Water and sediment quality guidelines

Water Quality Guidelines (adapted and updated from Annex 3 of the WIOLaB Regional Synthesis Report)

Parameter	Mauritius	South Africa	Madagascar	Remarks
Physico-chemical properties				
Temperature	Ambient	Ambient +/- 1°C	-	
Salinity	-	33.1 - 36.1ppt	-	Must be within this range
pH	6.5-9.0	7.3 - 8.2	-	
COD	5.0 mg/l			Maximum limit
Suspended solids	15 mg/l	10% ambient	-	
Dissolved oxygen	6.0 mg/l 25°C	5mg/l (99% of time)	-	
Bacteriological				
Total coliforms	1000 CFU ³ /100ml			
E. coli		0 – 130/100 ml		Not to be exceeded by the geometric mean of 2-weekly samples over 3 months
Faecal coliforms (contact recreation)		0 – 100/100ml		80% of samples < 100 counts and 95% < 2,000 counts
Nutrients				
NH ₃ (unionised ammonia)		15 – 58 ug/l		
Total inorganic Nitrogen (NH ₃ + NH ₄ + NO ₂ + NO ₃)		600 mg/l		
NO ₃	0.2-1.0			differs per water
PO ₄	0.04 - 0.1 mg/l			differs per water
Orthophosphate		5 – 25 ug/l		estuaries
Trace metals (ug/l)				
Arsenic (As)	0.05	12	-	
Cadmium (Cd)	0.02	4	1	
Chromium (Cr)	0.05	8	-	
Copper (Cu)	0.05	5	3	
Lead (Pb)	0.05	12	4	
Mercury (Hg)	0.0005	0.3	-	
Nickel (Ni)	-	25	-	
Zinc (Zn)	-	25	10	
Manganese (Mn)	-	-	20	
Hydrocarbons				
Phenols	0.05	-	-	
Oil and greases	undetectable	-	undetectable	

Sediment quality guidelines (adapted and updated from Annex 3 of the WIOLaB Regional Synthesis Report)

Trace Metal	Target (mg/kg dry weight)	
	South Africa	Madagascar
Arsenic	< 30	-
Cadmium	< 1.5	0.2
Chromium	< 50	5
Copper	< 50	5
Lead	< 100	5
Mercury	< 0.5	0.02
Nickel	< 50	5
Zinc	< 150	10
Combined levels of Cd & Hg	< 1.0	-
Combined levels of As, Cr, Cu, Pb, Ni & Zn	< 50	-