Preventing and Managing Marine Litter in West, Central and Southern Africa

A review

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Convention d'Abidjan
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A UNEP Partner

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Abbreviations

ALDFG	Abandoned, lost or otherwise discarded fishing gear
CMS	Convention on the Conservation of Migratory Species of Wild Animals
ECOWAS	Economic Community of West African States
EPS	Expanded polystyrene
GDP	Gross domestic product
GPA	Global Programme of Action for the Protection of the Marine Environment from Land-based Activities
GESAMP	Group of Experts on the Scientific Aspects of Marine Environmental Protection
IMO	International Maritime Organization
LME	Large marine ecosystems
MARPOL	International Convention for the Prevention of Pollution from Ships
OECD	Organisation for Economic Co-operation and Development
PAME	Protection of the Arctic Marine Environment
SEAFO	South East Atlantic Fisheries Organisation
UK	United Kingdom
UNCLOS	United Nations Convention on the Law of the Sea
UNEA	United Nations Environment Assembly
UNEP	United Nations Environment Programme
US	United States of America
UV	Ultraviolet

1. Introduction

1.1 Rationale

West Africa's contribution to Africa´s GDP growth has increased over the last few years—from below 7 percent in 2016 to more than 28 percent in the last two years (African Development Bank 2020). This growth, compounded by various drivers of marine litter production, leads to predictions of a steady increase in the volume of litter entering the ocean from land in the West, Central and Southern African coastal region (Jambeck et al. 2018).

To efficiently respond to marine litter management challenges, both land- and sea-based sources must be addressed. Most human activities that contribute to marine litter are related to the production, manufacturing, transport, trade, consumption and inappropriate disposal of goods (Group of Experts on the Scientific Aspects of Marine Environmental Protection [GESAMP] 2015; United Nations Environment Programme [UNEP] 2017). Governance has a key role to play in this area. A number of agreements have been adopted at the international and regional levels with direct or indirect measures to prevent marine litter, yet large knowledge gaps remain in translating these measures into regional and national action plans.

The diversity of marine litter pathways to the environment and their known and unknown impacts are making it increasingly difficult to understand and coordinate efforts to manage marine litter – an issue of global importance. Marine litter comes in various sizes, impacting the entire food web and our societies. Environmental impacts of marine litter range from wildlife entanglement and ingestion to habitat damage. Marine litter is also an eyesore, degrading the marine and coastal environment. These impacts pose substantial economic risks to commercial fish stocks, the tourism industry, and other associated ecosystem services.

The United Nations Environment Assembly (UNEA) has adopted several resolutions on marine litter and microplastics (see annex I). Paragraph 1 of UNEA Resolution 3/7 adopted in 2017 "stresses the importance of long-term elimination of discharge of litter and microplastics to the oceans and of avoiding detriment to marine ecosystems and the human activities dependent on them from marine litter and microplastics." This global goal of elimination was reinforced in UNEA resolution 4/6 adopted in 2019. UNEP has also been requested to support countries in the development of marine litter action plans. Six new regional marine litter action plans are under development or assessment, including for the West, Central and Southern Africa region.

The Abidjan Convention Secretariat has initiated the implementation of its CoP.12/7 and CoP.12/16 decisions on Marine Waste and Integrated coastal and ocean management policy, adopted during COP12, held in Abidjan in April 2017. To this end, in the framework of the ACP-MEAs III programme funded by the EU and UNEP, the Abidjan Convention is working with partners to develop a regional legal framework and national plans against plastic pollution in the region.

Regional Seas Conventions and Action Plans play a crucial role in facilitating action at the national level. It is therefore important to identify the challenges faced by member states in preventing and managing marine litter and prioritize actions to overcome the barriers and improve the effectiveness of national and regional efforts.

This assessment supports delivery of the implementation of UNEA resolutions on marine litter and microplastics, funded by Norway. The project is developing the first marine litter assessment for the Abidjan Convention area to inform the design of a marine litter action plan for the West, Central and Southern Africa region. It also contributes to the generation and dissemination of information to support action and informs the development of national action plans on marine litter as part of the Global Programme of Action on the Protection of the Marine Environment from Land-based Activities and the Global Partnership on Marine Litter.

1.2 Objectives

The main objectives for this review are to gather knowledge to prevent and manage marine litter in West, Central and Southern African countries of the Abidjan Convention. More specifically, they are to:

- Gather knowledge to serve as the basis of the development of a regional action plan, and increase understanding and dissemination of information on marine litter in the environment.
- Enhance knowledge and understanding of sources, pathways, relevant policy information on marine litter management which can feed into legislation, national communication and outreach.
- Identify information gaps and awareness-raising needs on marine litter challenges.
- Provide preliminary mapping of stakeholders, initiatives, projects and financing.

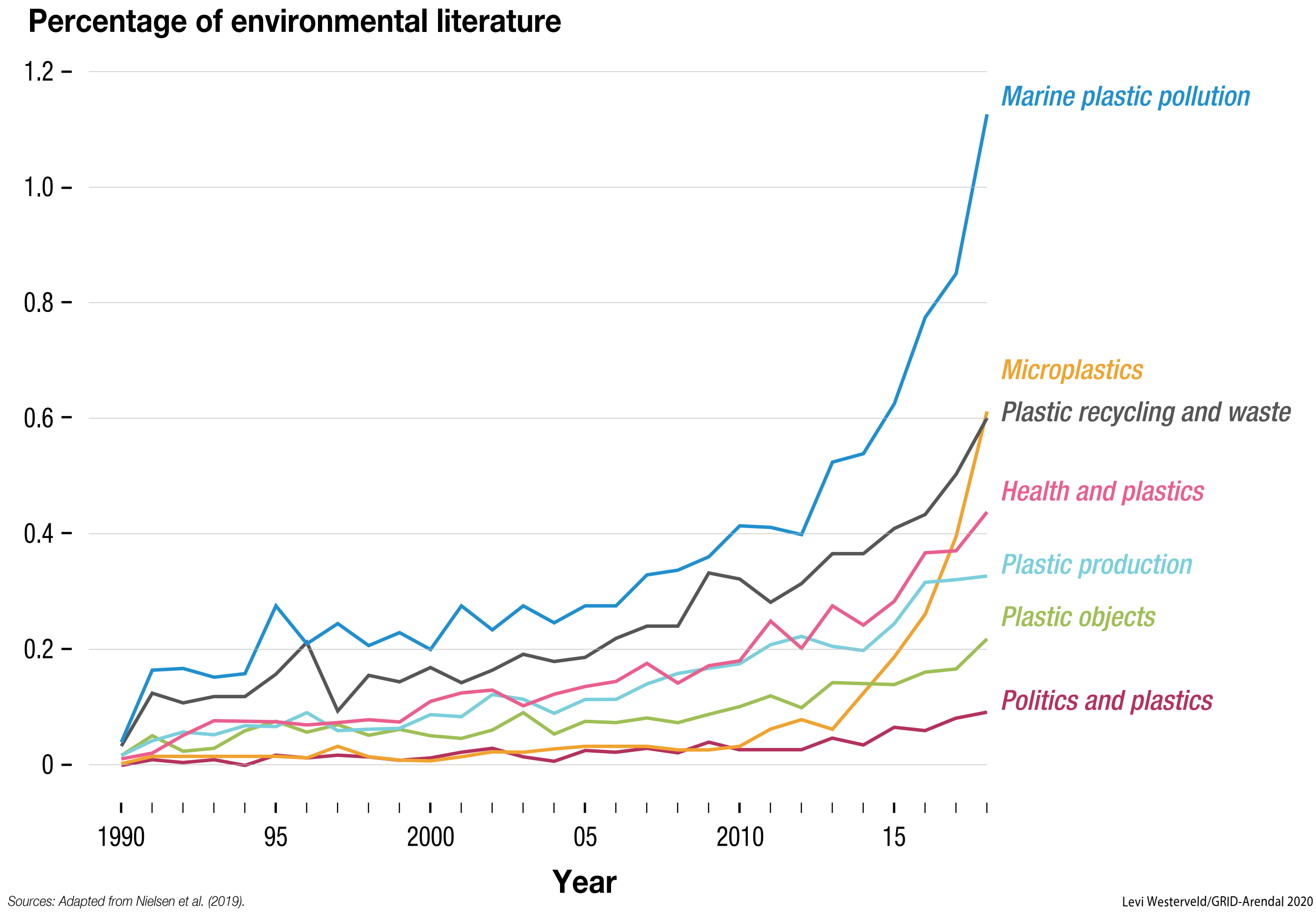

Figure 1. *Percentage of environmental literature focusing on specific aspects of plastic pollution*

1.3 Data gathering and methodology

This report brings together available information on marine plastic litter and microplastics in the coastal and marine region of West, Central and Southern Africa. At the global level, the number of studies investigating the environmental and socioeconomic impacts of marine plastic and microplastic litter has significantly increased within the last two decades (Nielsen et al. 2019). For example, the number of scientific papers on the distribution of and/or biological responses to marine litter has increased significantly since 2000 (Rochman et al. 2016). Nevertheless, there is a stark lack of research focused on West, Central and Southern coastal regions of Africa, which remains understudied.

To identify the current state of knowledge on marine litter in the region, we used two different approaches:

1. Conducting a literature review of published information to collate the available knowledge on marine litter in the region.
2. Supplementing the available knowledge with information gathered at three subregional workshops.

1.3.1 Literature review

We used the Web of Science platform to search for publications on marine plastic and microplastic pollution. We used keywords associated with the terms "mesoplastic", "microplastic" and "nanoplastic" (including marine plastic, marine debris, plastic pollution, plastic debris, marine litter, marine debris, marine microplastic and microplastic, marine nanoplastic, nanoplastic, marine mesoplastic, mesoplastic, freshwater plastic and freshwater litter). We also combined these keywords with geographic terms, focusing on:

- Key marine regions (for example, the North Atlantic, Equatorial Atlantic, South Atlantic, Gulf of Guinea)
- Specific geographical areas associated with large marine ecosystems (for example, the Mediterranean, the Strait of Gibraltar, the Canary Current, the Guinea Current and the Benguela Current)
- Specific countries (Angola, Benin, Cabo Verde, Cameroon, Cote d'Ivoire, Democratic Republic of the Congo, Democratic Republic of Sao Tome and Principe, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Morocco, Mauritania, Namibia, Nigeria, Republic of the Congo, Senegal, Sierra Leone, South Africa, Togo).

1.3.2 Subregional workshops

As some of the scientific information online is out-of-date and the search was largely restricted to the English language in a region where other languages, such as French and Portuguese, are widely used, information was provided

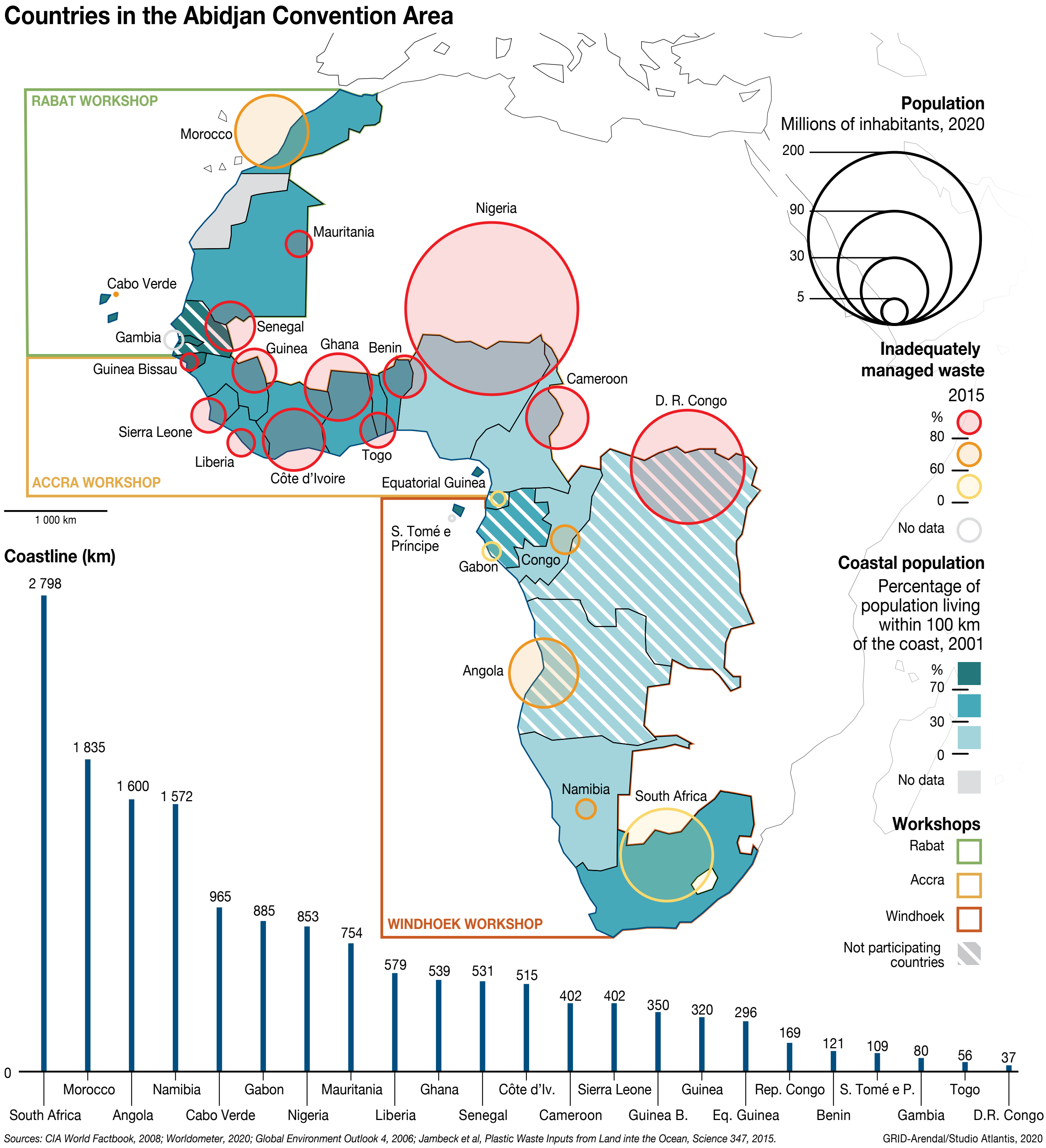

Figure 2. *Countries that participated in the sub-regional workshops*

by country representatives who participated in a series of workshops (annex II). The information shared in these three workshops has been summarized in the document Workshops on preventing and managing marine litter in West, Central and Southern Africa (GRID-Arendal 2020). It represents the participants' points of view and perceptions and should not be considered a statistically robust analysis. Nevertheless, the information relevance was insured by a careful selection of participants on the basis of their local experties. As illustrated in Figure 2, the workshops were hosted in Ghana (by the Environmental Protection Agency), Morocco (by the Mohammed VI Foundation for Environmental Protection) and Namibia (by the Ministry of Works and Transport) in September 2019 and facilitated by UNEP and GRID-Arendal, including the compilation of information gathered on marine litter and microplastic. Practical support was provided by the Abidjan Convention Secretariat. Three workshop participants from each country were nominated by UNEP, the International Maritime Organization (IMO) and the Food and Agriculture Organization of the United Nations (FAO). The workshops were held in French and English, with simultaneous interpretation. Transcripts were made of the recordings and combined with notes taken during the workshop presentations and discussions (verbal consent was provided by all participants).

2. Geographic scope and definitions

> The interconnected nature of the world's oceans and the buoyancy of marine litters mean it could originate from virtually anywhere in the world's oceans. However, areas and oceanic currents in the immediate vicinity should be considered the most likely potential sources

This desk study focuses on the West African coast, including Abidjan Convention member states from Mauritania to South Africa, including Morocco,[1] covering a region which encompasses the coasts and oceans of West, Central and Southern Africa, from the Strait of Gibraltar in the north to Cape Agulhas in the south (Figure 2). The area covers more than 14,000 km of coastline and includes three large marine ecosystems: the Canary Current, the Guinea Current and the Benguela Current (Figure 3). While the region primarily consists of countries in mainland Africa, it includes some small island developing states, such as Cabo Verde and the Democratic Republic of Sao Tome and Principe.

The interconnected nature of the world's oceans and the buoyancy of items such as certain types of plastic, fishing gear and processed wood mean marine litter in West, Central and Southern Africa could originate from virtually anywhere in the world's oceans (Figure 3). However, areas and oceanic currents in the immediate vicinity should be considered the most likely potential source.

The land-based boundary for the geographic scope of this study is the limit of the West, Central and Southern Africa watershed. The watershed includes the catchment areas of the rivers flowing into the marine environment.

1. Angola (did not participate in the workshops), Benin, Cabo Verde, Cameroon, Cote d'Ivoire, Democratic Republic of the Congo (did not participate in the workshops), Equatorial Guinea (did not participate in the workshops), Gabon (did not participate in the workshops), Gambia, Ghana, Guinea-Bissau, Liberia, Mauritania, Morocco, Namibia, Nigeria, Republic of the Congo, Senegal (did not participate in the workshops), Sierra Leone, São Tome e Principe, South Africa and Togo.

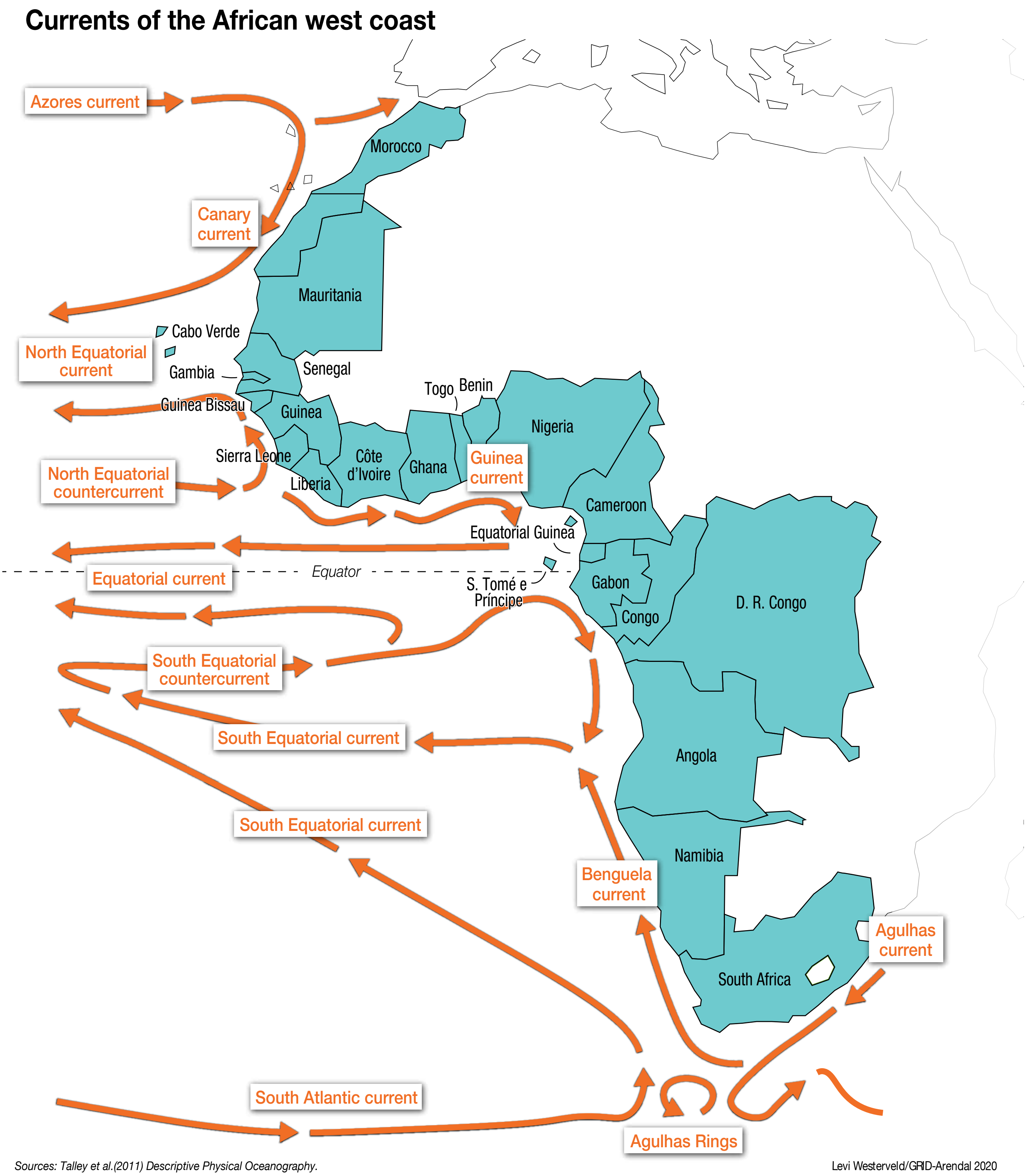

Figure 3. *Map of ocean currents off the western coast of Africa*

Marine litter, also known as marine debris, is defined as "any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment" (UNEP 2009). It can consist of plastic, paper, engineered wood, textiles, metal, glass, ceramics, rubber or any other human-made material that presents challenges when it degrades in the environment. The terms "macrolitter"/"macroplastics", "meso-litter"/"mesoplastics", "microlitter"/"microplastics" and "nanolitter"/"nanoplastics are descriptive terms that enable the practical comparison of monitoring data by size.

Microplastic litter is of particular concern because its size allows it to impact a wide range of organisms and ecosystems. One specific example is the potential risk of microplastics and even smaller nanoplastics to human health through dietary and respiratory exposure. Microplastics are commonly defined as small particles or fragments of plastic measuring less than 5 mm in diameter (GESAMP 2015). Primary microplastics are plastic microparticles specifically manufactured for industrial and domestic purposes while secondary microplastics are created by the weathering and fragmentation of larger plastic objects (UNEP 2016a).

3. Governance frameworks

Governance is a broad concept that involves legal and policy frameworks, ranging from binding and voluntary instruments to guiding principles. Several agreements have been adopted at the international and regional levels with direct or indirect measures to prevent marine litter. The United Nations Convention on the Law of the Sea provides an overarching global framework for the prevention of pollution from both land- and sea-based sources.[2] Articles 192–195 establish the duty to prevent pollution of the marine environment from all sources and are regarded as customary law (Birnie, Boyle and Redgewell 2009), which means they are binding to all countries, irrespective of whether an instrument of ratification has been deposited.

3.1 The international governance framework

3.1.1 Prevention of land-based sources of marine litter

Prevention of pollution from land-based sources is less regulated at the international level. One key international instrument is the United Nations Convention on the Law of the Sea (UNCLOS), which requires all States to adopt laws and regulations to prevent, reduce and control pollution from land-based sources. Such sources include rivers, estuaries, pipelines and outfall structures (art. 207). Major international instruments of relevance to marine litter governance, including adopting an integrated source-to-sea approach to combating marine litter and microplastics from all sources (see annex I). This instrument recognizes that plastic litter and microplastics are transported from land-based sources to the oceans by rivers, run-off or wind and that plastic litter is a significant source of microplastics. It also allows the land-sea and freshwater-sea interfaces to be included in action plans for preventing marine litter, including microplastics.

The voluntary guidelines adopted by parties to the Convention on Biological Diversity through Decision COP XIII/10 include short- and long-term measures to prevent and mitigate land-based sources of marine litter, including upstream activities, market-based instruments and the promotion of structural economic changes. The guidelines also encourage parties to assess and strengthen national legislation and incentives to eliminate the production of microplastics that have adverse impacts on marine biodiversity (para. 8).

Parties to the Convention on the Conservation of Migratory Species of Wild Animals (CMS) adopted an updated resolution on management of marine debris at the Twelfth Meeting of the Conference of the Parties (COP12) in 2017 (repealing resolutions 10.4 and 11.30). The revised resolution encourages compliance with the suggestions in three reports developed under the CMS, which cover:

- Knowledge gaps in management of marine debris
- Commercial marine vessel best practice
- Public awareness and education campaigns

(UNEP/CMS/COP11/Inf.27, Inf.28, Inf.29).

Major international instruments of relevance to marine litter governance

1972	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter
1973	International Convention for the Prevention of Pollution from Ships (MARPOL)
1975	Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean
1979	Convention on the Conservation of Migratory Species of Wild Animals (CMS)
1981	Convention for the Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region
1982	United Nations Convention on the Law of the Sea (UNCLOS)
1989	Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal
1985	Montreal Guidelines for the Protection of the Marine Environment against Pollution from Land-based Sources
1992	Convention on Biological Diversity (CBD)
1992	Agenda 21 for Sustainable Development
1995	Basel Convention Ban Amendment
1995	United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks
1995	Code of Conduct for Responsible Fisheries
1995	Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA)
1996	Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter
2015	Agenda 2063: The Africa We Want
2018	Bali Declaration on the Protection of the Marine Environment from Land-based activities

2. Land-based sources: sources of pollution that originate from activities on land such that the particles or substances released from these sources are dependent on pathways to reach the ocean. Sea-based sources: sources of pollution that originate from activities at sea that are not dependent on pathways to reach the ocean.

The voluntary Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA), adopted in 1995, lists litter as a contaminant of concern. It also lists wastewater treatment facilities, industrial facilities, recreational and tourism facilities, aquaculture and landfills as coastal and upstream sources of degradation of the marine environment. Countries are encouraged to develop national programmes of action to address these and other issues.

3.1.2 Waste trade

The international trade of hazardous and non-hazardous waste, among others, is regulated by the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel Convention). The convention aims to reduce the generation of waste (art. 4(2.a)) and promotes disposal as close as possible to the source (art. 4(2.b, d)) (Kummer Peiry 2013). If this is not possible, the transboundary movement of hazardous and other waste is permissible under specified conditions. Recent amendments to the Basel Convention came into force in January 2021 and provide strengthened regulation of the trade of plastic waste. Recyclable plastic waste must be pre-sorted by the exporting country to the level of near-zero contamination to enable minimal or no preparation before recycling. Requirements for the export of plastic waste that does not conform to this specification include a procedure for prior informed consent by the importing country.

The Basel Convention Ban Amendment (Decision III/1) came into force in December 2019, prohibiting the parties in annex VII of the Basel Convention (parties and other countries that are members of the European Union, Organisation for Economic Co-operation and Development (OECD) and Liechtenstein) from exporting hazardous waste to all other parties to the Basel Convention not listed in annex VII. This would include wastes that contain plastics and meet the criteria for classification as a hazardous waste under the convention.

3.1.3 Prevention of sea-based sources of marine litter

The duty to prevent marine pollution from sea-based sources has been recognized at the international level. UNCLOS requires countries to adopt legislation that is no less effective than global rules and standards for the prevention of marine pollution (art. 207 to art. 212). These duties are given effect in the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention) and the associated protocol (London Protocol), and the International Convention for the Prevention of Pollution from Ships (MARPOL).

The London Convention, followed by the London Protocol, prohibits the intentional disposal of waste that is generated on land in all maritime zones. This includes "persistent plastics and other persistent synthetic materials, for example, netting and ropes, which may float or may remain in suspension in the sea in such a manner as to interfere materially with fishing, navigation or other legitimate uses of the sea" (art. 4, annex 1).

In contrast to waste generated on land, MARPOL annex V makes provision for pollution by plastic waste generated during the normal operations of a vessel while at sea. This was strengthened in 2018 by the adoption of the IMO Action Plan

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to Address Marine Plastic Litter from Ships. The action plan promotes the reporting of lost fishing gear and the delivery of recovered fishing gear to land-based facilities.

Fishing gear is dealt with more specifically in the United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (Fish Stocks Agreement). Similarly, the voluntary FAO Code of Conduct for Responsible Fisheries (Code of Conduct) promotes the adoption of operational methods that minimize the loss of fishing gear (art. 8(4.6)), and the FAO voluntary guidelines promote marking of fishing gear (FAO 2019).

The Fish Stocks Agreement applies to all countries that fish on the high seas for straddling or migratory fish stocks, regardless of whether they are a contracting party to the agreement (art. 1(3)). All signatory parties aim to adopt measures to minimize catch by lost or abandoned gear and impacts on associated and dependent species, in particular endangered species (art. 5(f)). Countries must also monitor and conduct research on the impact of derelict fishing gear (arts. 5(l), 6(3.d)).

Where regional fisheries organizations have been established to manage straddling or migratory fish stocks, the Fish Stocks Agreement requires coastal states to become members of these organizations. Only members or countries that agree to abide by the rules adopted by the regional fisheries organization will have access to the relevant fisheries resources (art. 8(3, 4)). For example, the South East Atlantic Fisheries Organisation (SEAFO) System of Observation, Inspection, Compliance and Enforcement prohibits vessels from deliberately abandoning fishing gear except for safety reasons (SEAFO 2013) (Figure 4).

The Convention on Biological Diversity contains measures indirectly related to sea-based sources of marine litter. Aichi Biodiversity Targets 8 and 10 deal with pollution and anthropogenic pressures on vulnerable ecosystems. In 2016,

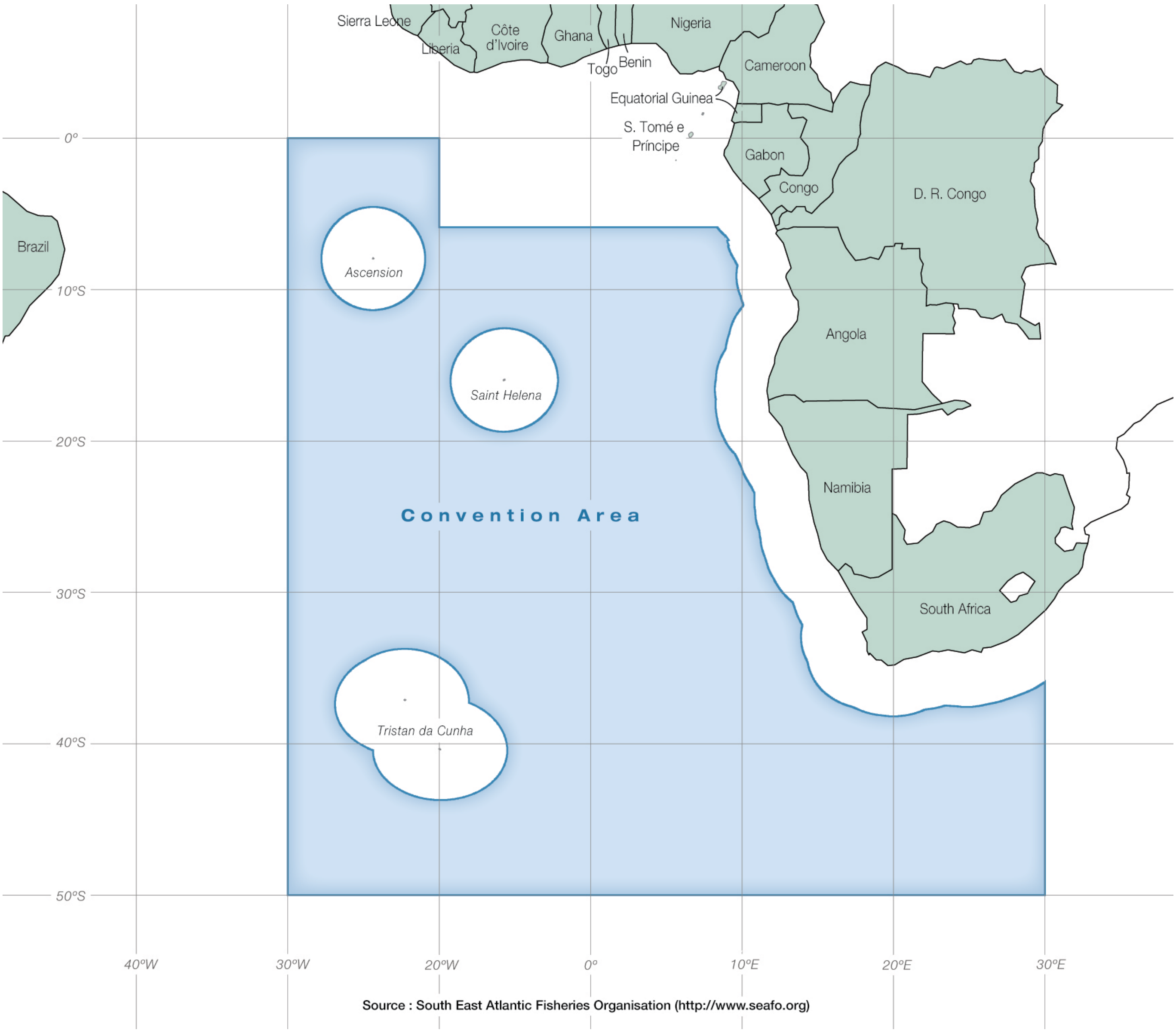


Figure 4. *Area covered by the Convention on the Conservation and Management of Fisheries Resources in the South East Atlantic Ocean, enforced by the South East Atlantic Fisheries Organisation*

the parties to the convention strengthened these measures in Decision COP XIII/10, which provides voluntary guidelines on preventing and mitigating marine litter and promotes the implementation of legal and policy frameworks to protect the marine and coastal environment from the discarding, disposal, loss or abandonment of persistent, manufactured or processed solid material. The guidelines in the annex to the Decision also encourage several measures to reduce sea-based sources of marine litter, particularly the identification of "options to address key waste items from the fishing industry and aquaculture that could contribute to marine litter," encouraging the investigation of initiatives such as deposit schemes, voluntary agreements and end-of-life recovery options (para. 9).

The International Convention for the Regulation of Whaling, adopted in 1946, established the International Whaling Commission. The Commission was mandated to "encourage, recommend, or if necessary, organise studies and investigations relating to whales and whaling" (art. IV(a)). The Commission hosted two workshops on marine debris in 2013 and 2014, respectively. These focused on fishing gear, plastics and microplastics, particularly the scientific aspects, threats and mitigation options, including collaboration and legal frameworks. In 2014, the Commission's pollution project began assessing the toxicity of microplastics and polycyclic aromatic hydrocarbons (PAHs) in cetaceans.[3] Other focus areas for the Commission include removal of fishing gear from entangled whales.

3.2 The regional governance framework

The Basel Convention contains provisions to protect developing countries from the exporting of hazardous and other waste (art. 4(2.e), 13). Before the adoption of the Ban Amendment, these were elaborated and strengthened by the Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa 1991 (Bamako Convention), which entered into force in 1998.

The Abidjan Convention was adopted in 1981 under the UNEP Regional Seas Programme (UNEP 2014b). Regarding marine litter, the convention requires contracting parties to take all appropriate measures to prevent, reduce, combat and control pollution from ships (art. 5), dumping from ships and aircraft (art. 6), land-based sources (art. 7) and activities relating to the exploration and exploitation of the seabed and its subsoil (art. 8). The contracting parties must also establish research and monitoring programmes at the national level for all types of pollution occurring in the convention area (art. 14(2)).

The Protocol concerning Land-based Sources and Activities to the Abidjan Convention lists tourism, the recycling industry, the rubber and plastics industry, the beverages industry, waste incineration and waste management as activities of concern to be prioritized, alongside litter, in developing action plans or other measures (annex I). Contracting parties must adopt legislative and regulatory measures (art. 5(3)) to prevent pollution from point sources (art. 7) and diffuse sources (art. 8) and must prevent transboundary pollution (art. 10). The "polluter pays" principle may also be considered in fulfilling these obligations (art. 5(2)).

Major regional instruments of relevance to marine litter governance

1991	Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa
1981	Abidjan Convention
2005	African 10-Year Framework Programme
2012	South East Atlantic Fisheries Organisation System of Observation, Inspection, Compliance and Enforcement
2012	Protocol concerning Land-based Sources and Activities
2015	Agenda 2063
	+ 18 Regional Cooperation Agreements

Integrated solid waste management is listed as a priority area in the African 10-Year Framework Programme on Sustainable Consumption and Production (2005–2015), which promotes waste prevention, minimization, reuse and recycling. Draft regional strategies on plastic waste management, e-waste and hazardous waste are being developed within the Economic Community of West African States (ECOWAS)[4] and revisions to the ECOWAS Environmental Action Plan will include waste management and plastics (UNEP 2018a; United States Agency for International Development [USAID] 2018).

Agenda 2063: The Africa We Want was adopted in 2015 by the African Union Assembly of Heads of State and Government. The first 10-year plan for the agenda (2014–2023) promotes improved sanitation and targets a recycling rate of at least 50 per cent of waste generated in cities (African Union Commission [AUC] 2015). The implementation plan also calls for the development and implementation of policies that support the growth of urban waste recycling industries.

Underpinning the governance frameworks outlined in this and the previous section is the precautionary principle, now regarded as customary law (Warner and Marsden 2012). This principle is explicit in many multilateral agreements. While most countries in Africa are party to the agreements discussed in the previous paragraphs (UNEP 2018a), enforcement is commonly weak or lacking, particularly where measures adopted in multilateral agreements are not integrated into domestic laws (UNEP 2014a).

3. For more information on this project, see International Whaling Commission (2014). Experts gather for second marine debris workshop, 1 July. https://iwc.int/iwc-marine-debris-workshop. Accessed 7 January 2021.

4. The 15 members of ECOWAS are Benin, Burkina Faso, Cabo Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.

4. Status of marine litter

This section summarizes the status of marine litter in the West, Central and Southern Africa Region, with a particular focus on marine plastic and microplastic litter.

4.1 Sources and drivers

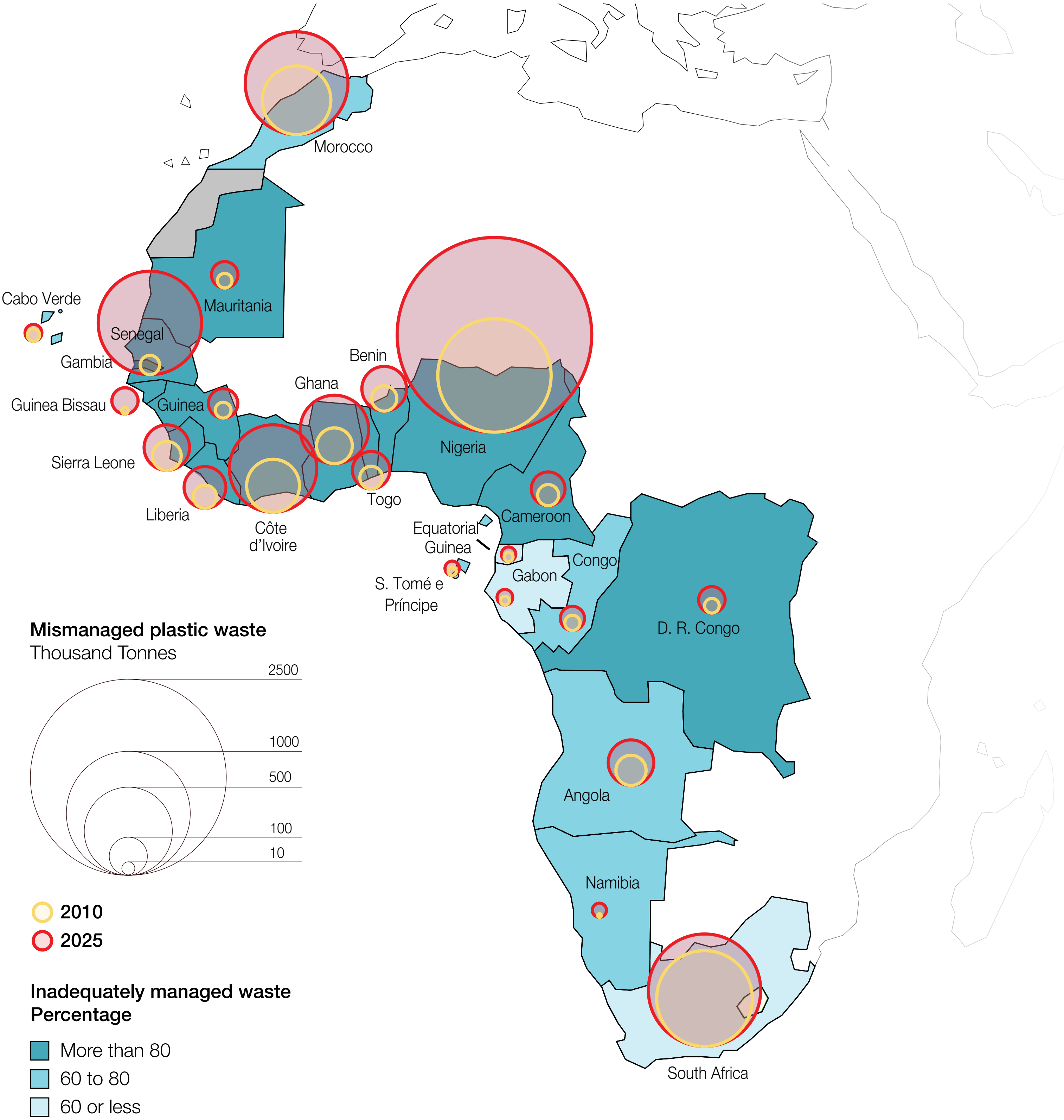
West Africa is reportedly one of the fastest growing regions in the world (United Nations 2015). This – together with drivers (Table 1) such as increased urbanization (Moura, J. et al. 2020), the rise of the middle class, poor disposal practices by citizens, increase of single-use products production and consumption and inadequate waste management systems – leads to predictions of a steady increase in the volume of litter entering the ocean from land in the West, Central and Southern African coastal region (Jambeck et al. 2018), as confirmed by the subregional workshop participants (GRID-Arendal 2020) and as illustrated in Figure 5. This dynamic is particularly acute in low-income countries, where levels of waste are expected to triple by 2050 (Silpa et al. 2018), highlighting the need for immediate action before the situation becomes much more complicated to address.

This situation is exacerbated by the increase in waste from economic sectors such as extraction, tourism, fisheries and agriculture, as well

Table 1. Proportion of workshop participants identifying certain primary drivers of marine litter creation

Primary drivers of marine litter creation identified by the workshop participants	Proportion of participants identifying it as a primary driver
1. Disposal behaviour	24%
2. Increased urbanization (especially in coastal areas)	21%
3. Poor waste management	18%
4. Transboundary currents	11%
5. Industrial activities	8%
6. Transport	6%
7. Population increases	6%
8. Recreational activities	3%
9. Tourism	3%

Source: GRID-Arendal 2020



Source: Jambeck et al., "Plastic Waste Inputs from Land into the Ocean." Science 347,2015

Figure 5. *Predicted mismanaged plastic waste in African countries*

as industrial sectors (Figure 6). Eighty per cent of the workshop participants identified economic sectors as primary sources of litter (GRID-Arendal 2020). Twenty per cent of the workshop participants identified human presence and behaviour, including waste disposal and human density (Figure 7), to be primary sources of litter. Jambeck et al. (2018) also identified several variables affecting litter creation, including weather-related factors, socioeconomic activities and population density. Nonetheless, as illustrated in Figure 2, there is no evidence that proves the existence of a direct correlation between high population density and the proportion of mismanaged litter, necessitating the consideration of additional factors such as economic wealth and social disadvantages shaping local disposal behaviour and appearing to be predominant drivers of litter creation (Jambeck et al. 2018).

Marine litter from economic sector activities

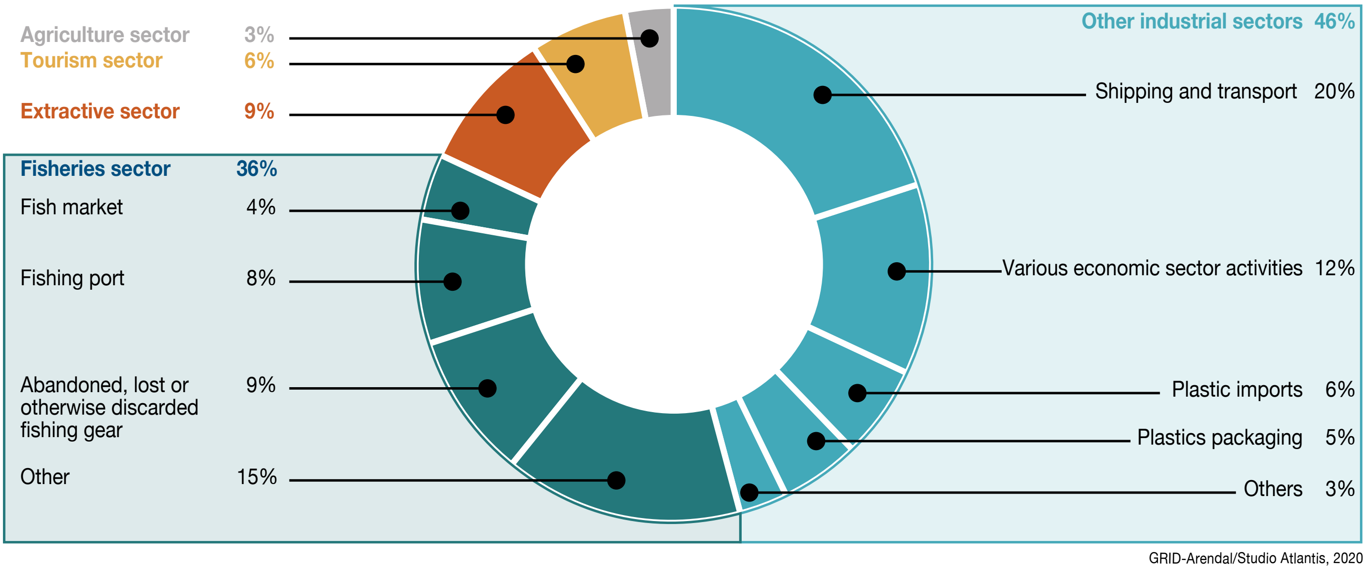


Figure 6. *Proportion of workshop participants identifying certain primary sources of marine litter creation (economic sector activities)*

Human presence and behaviour

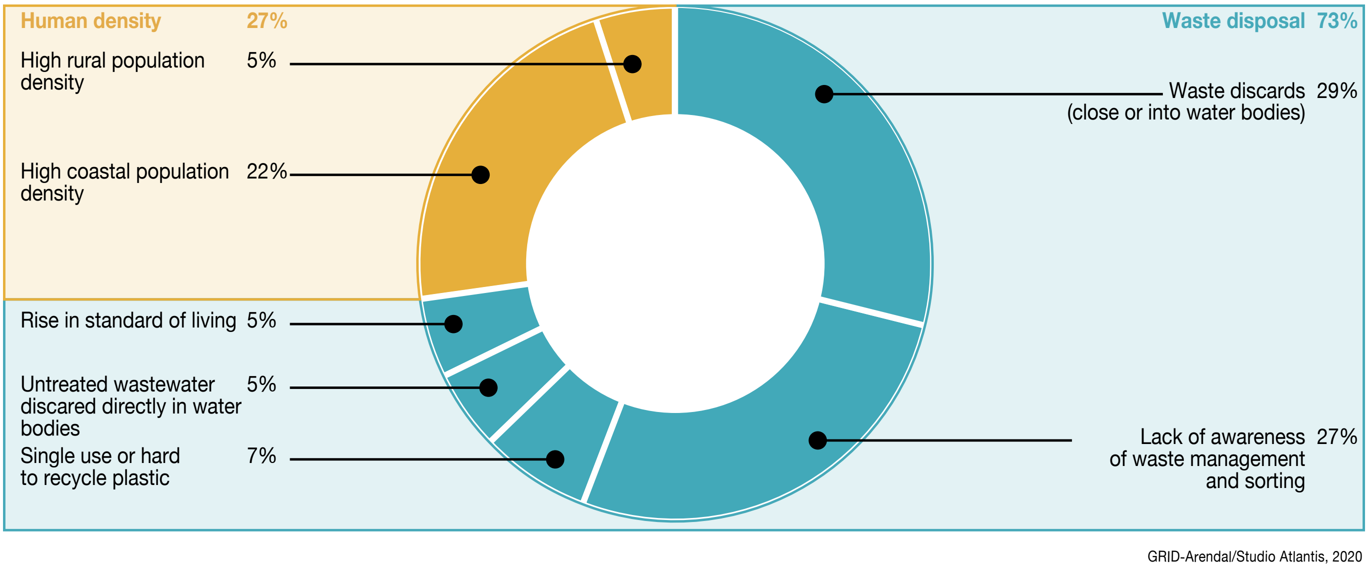


Figure 7. *Proportion of workshop participants identifying certain primary sources of marine litter creation (human presence and behaviour)*

4.1.1 Land-based sources

Most human activities that contribute to marine litter are related to the production, manufacturing, transport, trade, consumption and inappropriate disposal of goods (GESAMP 2015; UNEP 2017). These leakages are highly relevant for communities on or close to coastlines, where waste has a greater chance of entering the ocean directly. However, the contribution to marine litter from landlocked communities or countries should not be underestimated, since waste entering nearby water courses, such as rivers, streams and drainage systems, may eventually reach the ocean (Schmidt, Krauth and Wagner 2017). As such, a comprehensive approach to marine litter must consider the entire watershed. River systems in particular are subject to multiple sources of litter, including those from upstream city communities and neighbouring countries (Rech et al. 2014; Schmidt, Krauth and Wagner 2017).

To understand the current marine litter situation in West, Central, Southern and Western Africa, it is necessary to consider the drivers of litter and the resulting impacts. In general, African countries lack comprehensive and up-to-date empirical data on the production and management of waste (UNEP 2018a). This section discusses the primary land-based sources of marine litter as reflected in published data and complemented by the understanding and reflections of the Member State representatives who attended the three subregional workshops (GRID-Arendal 2020).

According to national experts from the Abidjan Convention area, the mainland-based sources of marine litter are the tourism sector, household-generated solid waste and wastewater, commercial and industrial activities, such as plastic producers and converters or local markets, and agricultural and extraction activities (Table 2).

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Table 2. Proportion of workshop participants identifying certain categories as land-based sources of marine litter creation

Land-based sources identified by the workshop participants	Proportion of participants identifying it as a source
1. Tourism	31%
2. Households	24%
3. Commercial and industrial (markets, shopping malls, supermarkets, offices, hawking)	12%
4. Agricultural activities	8%
5. Landfills	4%
6. Imported waste	4%
7. Illegal dumping	4%
8. Dump site waste transfers	4%
9. Hospitalsm	4%

Source: GRID-Arendal 2020

Solid waste and wastewater

Solid waste

Human populations are growing in the region, coupled with an increase in access to higher standards of living and consumption patterns. Previous assessments found that in 2016, the sub-Saharan Africa Region produced an average of 0.46 kg of waste per person per day, lower than the global average of 0.74 kg. But as global waste production increases by a projected estimate of almost 70 per cent between 2016 and 2050, sub-Saharan Africa is one of the regions expected to experience the fastest growth. By 2080, sub-Saharan Africa will be the world's leading generator of municipal solid waste (Silpa et al. 2018). Municipal solid waste in sub-Saharan Africa is expected to increase threefold by 2050 and tenfold by 2100 (Hoornweg, Bhada-Tata and Kennedy 2014; UNEP 2018a). This is particularly relevant to Africa as a whole since, according to figures for 2017, Africa's population of 1.3 billion people makes up approximately 17 per cent of the global population (UNEP 2018a). This percentage is projected to steadily increase to 40 per cent over the coming century, with the African continent attributed the highest projected

The countries in West, Central and Southern Africa region have some of the lowest levels of wastewater treatment in the same time of being reportedly one of the fastest growing regions in the world and presenting an expected level of waste to be tripled by 2050

There is no evidence of direct correlation between high population density and mismanaged waste proportion. Predominant drivers appear to be more related to economic wealth and social disadvantages shaping human activities and disposal behaviour

Biodegradable, bio-based and plant-based plastics are widely misused and misunderstood in terms of their environmental behaviour and fate

Open-air dumpsites are commonly located along the coastline, allowing large volumes of plastic waste to enter the oceans directly.

growth rate (Jambeck et al. 2018). This is highly relevant to marine litter, since solid waste production, population density growth and economic status are closely linked (Jambeck et al. 2015). Research has shown that effective waste management and consumer waste disposal behaviour are among the most important factors in preventing marine litter (Willis et al. 2018; Hardesty et al. 2016; Jambeck et al. 2018).

Like other developing regions, Africa's growing waste generation is driven by rapid urbanization, the rise of the middle classes and changes to lifestyles and consumption patterns (UNEP 2018a). This was corroborated by the subregional workshop participants (GRID-Arendal 2020). These socioeconomic changes are also expected to change the geographical configuration of cities (for example, the formation of informal settlements in peripheral areas) as well as the amount and composition of solid waste over time (UNEP 2018a).

Overall, government agencies, the waste management sector and infrastructure have not kept pace with the increasing rate of consumption and disposal in the region, resulting in a continuous and significant flow of waste into the natural environment. The 2018 UNEP report on waste management highlights this situation as especially concerning for African countries, since they often lack the capacity and infrastructure to implement sound waste management procedures, and lack knowledge on and awareness of the impacts of waste and litter disposal practices (UNEP 2018a).

Table 3. Production of municipal solid waste in countries of the West, Central and Southern Africa region

Country	Generation (tons/year)	Generation rate (kg/capita/day)
Angola	4,213,644	0.46
Benin	685,936	0.35
Cabo Verde	132,555	0.71
Cameroon	3,270,617	0.42
Congo (Rep.)	894,237	0.48
Cote d'Ivoire	4,440,814	0.64
Democratic Republic of the Congo	14,385,226	0.5
Equatorial Guinea	198,443	0.45
Gabon	238,102	0.56
Gambia	193,441	0.41
Ghana	3,538,275	0.51
Guinea	596,911	0.45
Guinea-Bissau	289,514	0.45
Liberia	564,467	0.43
Mauritania	454,000	0.36
Morocco	6,852,000	0.55
Namibia	256,729	0.55
Nigeria	27,614,830	0.49
Sao Tome and Principe	25,587	0.37
Senegal	2,454,059	0.44
Sierra Leone	610,222	0.31
South Africa	18,457,232	0.98
Togo	1,109,030	0.42

Source: Silpa et al. 2018

While organic material makes up more than half of solid waste in Africa (UNEP 2018a), the composition and volume of solid waste are expected to change over the coming decades. Consumption of paper and plastic packaging is expected to increase, while organic, metal and glass will decrease (Hoornweg, Bhada-Tata and Kennedy 2014). These changes are already apparent in the sub-Saharan Africa Region (Silpa et al. 2018).

Plastic is of particular concern, since it is a human-made material that does not degrade in the natural environment and therefore continues to accumulate in waterways and on shorelines. In 2012, plastics made up 13 per cent of waste generated in sub-Saharan Africa, compared with a global average of 10 per cent (Silpa et al. 2018; UNEP 2018a). With a few exceptions, consumption of plastic became commonplace in the Abidjan Convention area approximately two or three decades ago, but only became a significant environmental and social problem during the last decade (annex I). Table 4 shows the most common single-use plastics in use, as identified by the workshop participants.

Consumption patterns are moving towards a throwaway culture, with increased consumption of goods wrapped in plastic packaging. For coastal countries in the West, Central and Southern African Region, the rapid increase in the use of single-use plastics over the last decade has become a particular concern. The workshop participants indicated that these countries are all experiencing multiple barriers to effective waste management (GRID-Arendal 2020). For instance, one of the examples given during the workshops revealed that in some areas of South Africa, communities cannot afford to buy products in bulk and therefore small daily purchases are made. Combined with a lack of relevant education and affordable substitutes, these practices lead to consumption of significant amounts of single-use plastic items (GRID-Arendal 2020).

To comply with a new regulatory instrument, restricting or banning the use of single-use items, information and suitable alternatives must be provided. For instance, participants highlighted that local retailers in coastal countries in the West, Central and Southern African Region are producing reusable bags made of natural materials, such as jute, paper and cotton, as alternatives to plastic bags; leaves are increasingly replacing plastic food containers and cutlery; and clay pots are replacing plastic octopus traps (Table 4). However, the workshop participants also reported that the transition to long-lasting and natural products is limited by the higher prices of natural alternatives compared with their plastic equivalents (GRID-Arendal 2020).

The primary barriers to effective implementation of marine litter policies highlighted by the workshop participants and summarized in Figure 8 include inadequate or weak legislation and poor enforcement, lack of public awareness, insufficient public participation, lack of political will, political instability and conflicts, and poor allocation of budgets for waste collection and treatment.

Table 4. Top single-use plastic items identified in the West, Central and Southern Africa region during beach clean-ups, and their potential substitutes

Problematic single-use plastic items	Type of plastic	Potential substitute product
Flexible or light plastics (e.g. carrier bags, plastic foam for packaging)	High-density polyethylene (HDPE)	Reusable bags made from jute, paper and cotton; biodegradable bags
Sachets	High-density polyethylene (HDPE)	Biodegradable material
Cigarette butts	Cellulose acetate	–
Plastic bottles and bottle caps	Polyethylene terephthalate (PET), polypropylene (PP)	–
Plastic food containers and cutlery	Polystyrene (PS), polyethylene (PE)	Leaves for wrapping food
Plastic straws	Polypropylene (PP)	–
Sachet water bags	Low-density polyethylene (LDPE)	Improvement of pipe-borne water systems, stainless steel cups, ceramic cups, glass
Plastic cups	Extruded polystyrene foam (XPS)	Clay, glass, ceramics, bamboo, calabash
Diapers	Polypropylene (PP)	Cloth diapers
Sanitary and medical waste	–	–
Plastic sticks for lollipops and cotton swabs (Q-tips)	Polypropylene (PP)	Paper sticks for lollipops and cotton swabs (Q-tips)

Source: GRID-Arendal 2020

Barriers to sound waste management

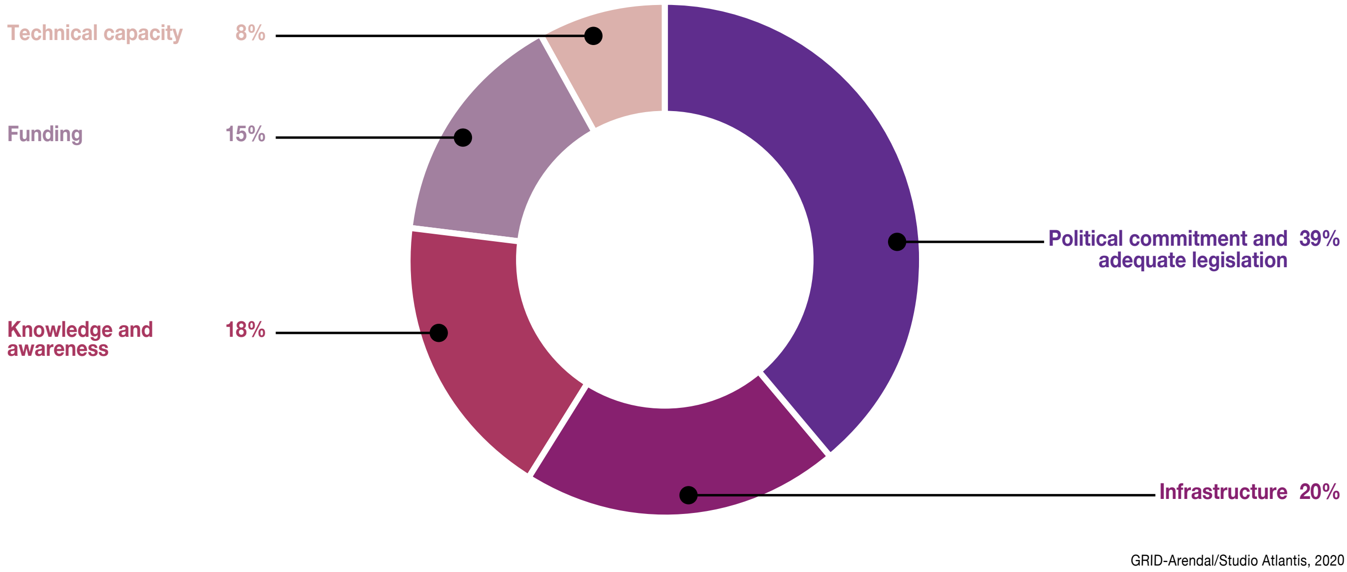


Figure 8. *Proportion of workshop participants identifying certain categories as primary barriers to sound waste management*

Estimates of waste collection rates in Africa range from 18 per cent to more than 80 per cent (UNEP 2018a) and vary widely in the countries of the West, Central and Southern African coastal region. Morocco, which runs parallel to the Canary Current, is in the process of joining the Abidjan Convention. At the subregional workshop, its representatives reported that it has a waste collection rate of over 85 per cent. According to the workshop participants representing Cabo Verde, Guinea-Bissau, Liberia, Mauritania and the Democratic Republic of Sao Tome and Principe, formal waste management infrastructure and technology in these countries are extremely limited, and in some cases, almost non-existent. As a result, the majority of the waste produced in these countries is dumped directly onto beaches or burned in uncontrolled conditions (GRID-Arendal 2020).

These factors contribute to the concerns about the expected growth of plastic production and consumption over the coming decades as inadequate essential waste management systems and infrastructure will lead to leakages (UNEP 2016a; UNEP 2018a). A commonly promoted solution in the West, Central and Southern Africa region is the transition from single-use plastics to biodegradable alternatives. However, workshop participants were concerned that such solutions may detract attention from developing measures to reduce dependency on and consumption of single-use plastics (GRID-Arendal 2020).

Biodegradable, bio-based and plant-based plastics are a large range of substitutes that are widely misused and misunderstood in terms of their environmental behaviour and fate. This results from a lack of awareness and sharing of knowledge, which has led to inappropriate use and disposal (UNEP 2015). The biodegradation of such products differs depending on the final environment in which they are disposed. Some bio-based products are only biodegradable under certain environmental conditions (Eriksen, Thiel and Lebreton 2016). For example, polylactic acid (PLA) is a compostable bio-based plastic that biodegrades only in industrial composting facilities where the required temperature, humidity and organism concentration conditions can be regulated. Polyhydroxyalkanoate (PHA) (made from the "off-gassing of bacteria") and poly(3-hydroxybutyrate-co-3-hydroxyvalerate) (PHBV) can degrade in the marine environment (Eriksen, Thiel and Lebreton 2016). However, UNEP warns that labelling products as biodegradable will not significantly decrease the environmental risks of plastics. This is particularly true in the marine environment, where the probability of achieving the conditions required for rapid biodegradation are lower than on land or at the shoreline level given that in these areas, ultraviolet (UV) radiation; oxidation; and fragmentation are more intense than in the water column or on the sea-floor (UNEP 2015). On the contrary, some products marketed as biodegradable may, in fact, not be. They may even contribute to the problem by encouraging pervasive litter behaviour such as inappropriate littering and interfering with and consequently impairing the efficiency of existing recycling activities, with biodegradable waste becoming mixed with other non-biodegradable waste streams (GESAMP 2015).

Factors hampering the development of sustainable waste management in the region include the rapidly growing population in each country and the proportion of mismanaged plastic waste, as well as the high population density. Higher population density may result in greater collective leakage of plastic waste from communities, despite the relatively low rate of mismanaged waste. It is important to assess population density, waste generation rates and mismanagement of waste within megacities independently of nationally averaged data. Despite data at the national level being sporadic, current estimates have focused on national averages of plastic waste produced in Africa (Silpa et al. 2018; GRID-Arendal 2020), without being disaggregated by type of area (rural, megacity, among others). Existing studies of national rates of waste collection within the region commonly focus on waste management practices in large cities or the wealthier neighbourhoods within those cities, with little to no data on rural areas. According to a recent

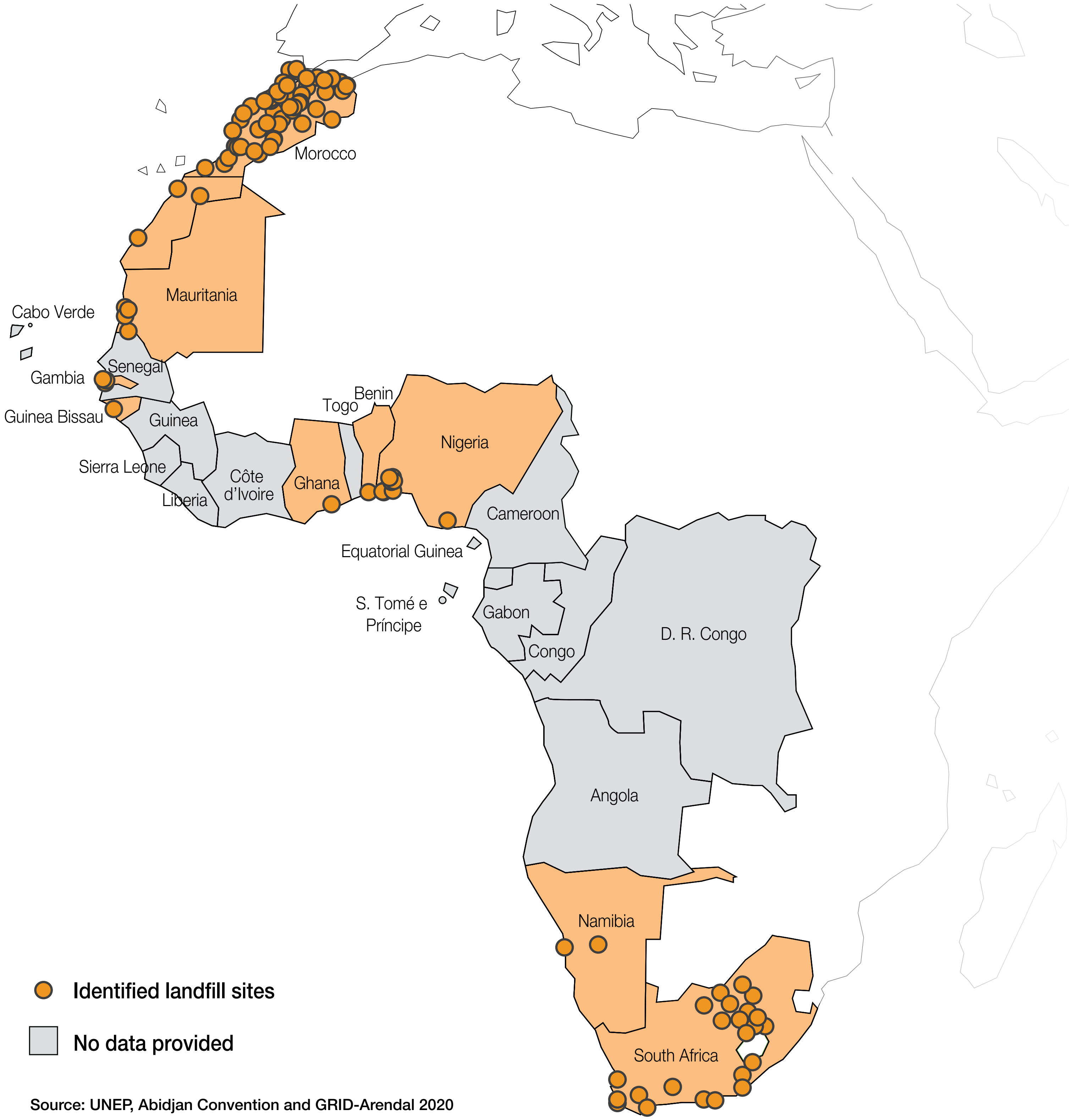


Figure 9. *Identified landfill sites in the West, Central and Southern African coastal region*

study, the waste collection rate in Tangier, Morocco is the lowest of all large cities in North Africa, while Rabat has a 90 per cent collection rate (Silpa et al. 2018).

Open-air dumpsites are commonly located along the coastline, allowing large volumes of plastic waste to enter the oceans directly. In sub-Saharan Africa, 69 per cent of waste is disposed of in open-air dumpsites, 24 per cent in landfills and 6.6 per cent is recycled (Silpa et al. 2018). Figure 9 displays the region's identified landfills, with most of the known landfills and dumpsites (which receive controlled, but also uncontrolled, waste due to inadequate or non-existent waste management systems leading to direct dumping) located near or along the coastline.

Rural and urban areas

While consumption and disposal practices in rural areas are often perceived as sustainable, this may not be the case in some parts of rural Africa. A case study by UNEP, based on previous research (Boateng et al. 2016), provided a comparative analysis of solid waste management in rural and urban areas of Ghana

(UNEP 2018a). The research concluded that differences between rural and urban waste disposal depend heavily on demographic and socioeconomic characteristics such as economic activities, literacy levels, age, household size and marital status. Similarly, a separate study found that metropolitan areas and municipalities in Ghana produce higher amounts of organic waste overall, while smaller districts produce more plastic waste (Miezah et al. 2015). The percentage of plastic waste varied significantly between the different regions of the country, with the northern regions having the highest levels of plastic waste.

As noted above, it is important to include population density in these studies in addition to urban population growth (Lebreton, Greer and Borrero 2012). This could be an essential factor for forecasting trends and future scenarios. In current estimates and forecasts for Africa, large cities along the Gulf of Guinea are the most densely populated. Coastal cities in close proximity, such as Accra (Ghana) and Lagos (Nigeria), and cities close to waterways, such as Kinshasa (Democratic Republic of Congo), have some of the highest population densities in the region (Jambeck et al. 2018). The workshop participants indicated that Ghana and Nigeria are among the leading countries in the Abidjan Convention area on waste management and marine litter control-related policy development and implementation (GRID-Arendal 2020). While some of the abovementioned cities have some of the highest rates of waste collection, they also have some of the highest rates of mismanaged plastic waste per capita in Africa (Jambeck et al. 2018). One of the contributing factors to this phenomenon is likely their significant population density.

In Africa, 60 per cent of the population currently lives in rural areas (UNEP 2018a). It is important to consider variances in waste generation and disposal, as well as the availability of sound waste management strategies and infrastructure. Waste management services are virtually non-existent in most areas and recent research has highlighted that most of the waste produced in rural areas of Africa is neither reused nor recycled (Hangulu and Akintola 2017; Silpa et al. 2018; UNEP 2018a; GRID-Arendal 2020).

Wastewater management

The term “wastewater” encompasses domestic effluent (black and grey water), effluent from commercial establishments, industrial effluent, stormwater and other forms of urban run-off, as well as agricultural, horticultural and aquaculture effluent (Sato et al. 2013). Volumes of wastewater disposed in Africa are increasing as a result of population growth and poor urban planning. The composition of municipal wastewater (the most common type in Africa) can vary considerably, reflecting the range of contaminants released by the different domestic, industrial, commercial and institutional sources. While the bulk of wastewater is made up of organic compounds, there are growing concerns about emerging pollutants in domestic wastewater, including detergents, microplastics and medication, which can have long-term impacts, even in low concentrations (United Nations World Water Assessment Programme 2017).

Jambeck et al. (2015) estimate that in most West, Central and Southern African countries, a large majority of domestic and industrial wastewater effluents that are released directly into the natural environment have not received any form of treatment. The countries in this region have some of the lowest levels of wastewater treatment in the world, alongside countries in Southeast Asia and Latin America. While wastewater can be a source of nutrients for plants, the release of untreated wastewater into the environment contaminates freshwater and marine ecosystems, creating a major challenge in terms of health and the environment (Corcoran et al. 2010; Khalid et al. 2018). Moreover, wastewater treatment in Africa is hampered by a lack of enforcement, resulting in treatment plants processing contaminants they were not designed to treat and high operational and maintenance costs.

Wastewater contamination can result in sanitary and health risks due to the presence of toxic contaminants and microbes (Khalid et al. 2018). The use of wastewater for crop irrigation can positively or negatively affect the quality and productivity of soil, crop production and human health (Qadir et al. 2010). Sludge from wastewater can contain synthetic substances such as microplastics and heavy metals. If used as compost, it reduces the effectiveness of the soil as a treatment system by poisoning the microorganisms that break down contaminants, destroying the physical structure of the soil and damaging the soil’s natural cycles (Durán-Álvarez and Jiménez-Cisneros 2014). Disruption of the integrity of these ecosystems reduces their capacity to provide ecosystem services.

4.1.2 Sea-based sources

The marine environment is vast, covering 72 per cent of Earth’s surface. UNCLOS was adopted in 1982 to protect and preserve the ocean, yet in maritime areas beyond national jurisdiction (bearing in mind that the high seas make up two-thirds of maritime waters), challenges remain in gathering data and understanding the contribution of all maritime activities to the problem, which presents enforcement challenges. Sea-based sources of marine litter are estimated to account for less than a quarter of all plastic in the world’s oceans (Silpa et al. 2018), but this estimate has been challenged and updated information is required (Jambeck et al. 2015). FAO, the GESAMP working group on sea-based sources of marine litter (Working Group 43) and the Global Ghost Gear Initiative are currently working on building a better understanding of the level of sea-based sources of marine litter and its impacts on marine ecosystem health (Jambeck et al. 2018; Richardson, Hardesty and Wilcox 2019).

In maritime areas beyond national jurisdiction making up two-thirds of maritime waters, challenges remain in gathering data and understanding the contribution of all maritime activities to the problem, which presents enforcement challenges.

There are large gaps in coastal marine litter monitoring and data concerning abandoned, lost or otherwise discarded fishing gear in the West, Central and Southern Africa region.

Table 5. Proportion of the workshop participants identifying certain activities as sea-based sources of marine litter

Sea-based sources identified by the workshop participants	Proportion of participants identifying it as a source
1. Dumping at sea (vessels and platforms)	53%
2. Fishing activities	35%
3. Various environmentally unsustainable vessel activities	12%

Source: GRID-Arendal 2020

According to the subregional workshop participants, there is a severe lack of reliable and up-to-date data on sea-based sources of marine litter in the West, Central and Southern Africa Region (GRID-Arendal 2020). Experts taking part in the workshops agreed that the main sea-based contributions result from dumping, commercial fishing activities and offshore platforms (see Table 5). Other sources include small-scale fisheries, resulting in abandoned, lost or otherwise discarded fishing gear (ALDFG). Aquaculture is recognized as a source of marine litter and microplastics (FAO 2020), but this sector is poorly researched in the region and currently perceived as a minor source of marine litter by the workshop participants (GRID-Arendal 2020). Although this perception does not consider the projected rapid growth of fish food consumption in Africa (with an increase of about 26 per cent between 2017 and 2027), it is aligned with the projected decline in "per-capita fish consumption". This is mostly due to a fisheries sector (including aquaculture) that is struggling to keep pace with the growing population and demand (OECD 2018; FAO 2018).

Fisheries

Fishing gear, such as nets, fishing lines, traps, trawls and pots, are designed to trap marine life to provide food to millions of people worldwide. With plastics being more durable and cheaper than natural resources, most fishing gear is now made from synthetic materials (Macfadyen, Huntington and Cappell 2009). ALDFG can result from environmental conditions at sea or fishers' behaviour and continues to catch and kill marine life unintentionally long after being lost or discarded, posing a major risk for marine and human life at sea (see Section 4.2).

In 2018, most of the African region fishing production came from the marine capture sector with the Eastern Central and Southeast Atlantic regions producing over 7 million tonnes (representing 8% of the world marine capture production), and the inland capture sector producing 3 million tonnes (representing 24% of the world total inland capture) (FAO 2020). There are very few national large-scale fishing operations in the West, Central and Southern African Region. Most fishing gear in this area uses traditional low-technology techniques and on a small scale, with small fishing units that fall outside of mandatory monitoring systems and environmental controls like MARPOL. This likely contributes to the large gaps in data concerning ALDFG in the region (GRID-Arendal 2020). All Member State representatives who participated in the subregional assessment workshops reported that their marine ecosystems appear to be impacted by ALDFG (GRID-Arendal 2020). Similarly, the behaviour of fishers at sea is perceived to be an important driver, particularly the daily, deliberate disposal of waste overboard. Participants indicated that this waste can include both organic materials and plastics (GRID-Arendal 2020).

However, there was unanimous agreement among workshop participants that no data are available on the extent of the ecological and socioeconomic damage caused by ALDFG. The authorities struggle to adequately monitor and enforce compliance with policies by small or semi-industrial fishing boats. Improved monitoring of the impact of traditional and artisanal fishing practices on marine ecosystems and quantification of the volume of fishing gear lost at sea in the coastal region of West, Central and Southern Africa would greatly enhance the understanding and management of sea-based sources within the region.

Shipping

International legal and policy instruments have been adopted to prevent marine litter entering the ocean from sea-based sources (see Section 3). However, coastal marine litter monitoring and adequate surveillance remain weak on the west coast of Africa, which workshop participants attributed to a lack of resources.

According to the workshop participants, there are also indications of illegal dumping of car tyres from vessels, but there are no accurate or consistent monitoring data to this effect (GRID-Arendal 2020). The workshop discussions also revealed that in Cabo Verde, Gambia and Morocco, black tar balls resulting from improper cleaning of ships' oil storage tanks can be found on beaches in summer (GRID-Arendal 2020), despite these practices being prohibited by international instruments under MARPOL. Again, there are no monitoring data available in the West, Central and Southern African Region on such sources. Similarly, research in the Canary Islands noted the arrival of tar balls and pre-production virgin plastic pellets, which did not stem from local production, transported from the North Atlantic by the Canary Current (Herrera et al. 2018).

Offshore resource exploration and exploitation

During the workshops, regional experts confirmed that oil exploration and other exploitation activities may contribute to marine litter (GRID-Arendal 2020). However, the participants believe that, to the best of their knowledge, input from these sectors is minimal compared with other sectors because of the comprehensive nature of global regulations such as MARPOL and UNCLOS, which promote the environmentally friendly disposal of all wastes. No empirical data on this issue are currently available. The latest report by the Protection of the Arctic Marine Environment (PAME) Working Group notes that the "mapping of the distribution of rigs and platforms (in the Arctic) may provide a proxy for the geographic distribution of potential inputs of marine litter associated with these types of activities" (PAME 2019).

Aquaculture

In 2018, aquaculture in Africa was estimated to employ over 380,000 workers and produce almost 22 million tons of fish (FAO 2020). According to the workshop participants, the contributions of aquaculture and mariculture activities to marine litter are generally less researched. The equipment used may be similar to the fishing sector. Lost gear can include expanded polystyrene (EPS) floats, ropes, bags, and baskets. The removal of biofouling

Fish production in Africa

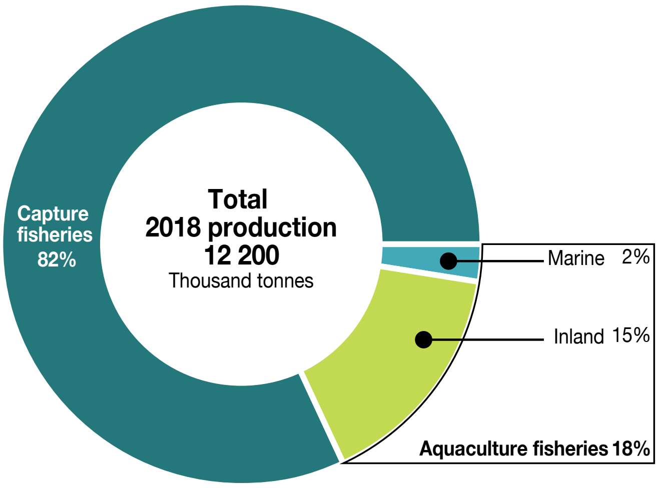


Figure 10. *Fish production in Africa*

from floats, nets and ropes can release microplastics in the form of fibres (Lusher, Hollman and Mendoza-Hill 2017). Workshop participants indicated that the aquaculture sector might play a limited role in the production of marine litter, but no evidence for this could be found (GRID-Arendal 2020).

The aquaculture world production level in 2018 reached 82.1 million tons with 2,196,000 tons specifically produced in Africa. This sector represents 18 per cent of the total fish production for the African region, with 86 per cent of the catches coming from inland aquaculture. Of note, even if worldwide the fishing aquaculture production is almost at the same level as the fishing capture production, in Africa the fishing sector remain largely dominated by marine captures (FAO 2020).

A general lack of information

The lack of information on the contribution of marine litter from different sea-based activities in the region was corroborated by all the workshop participants:

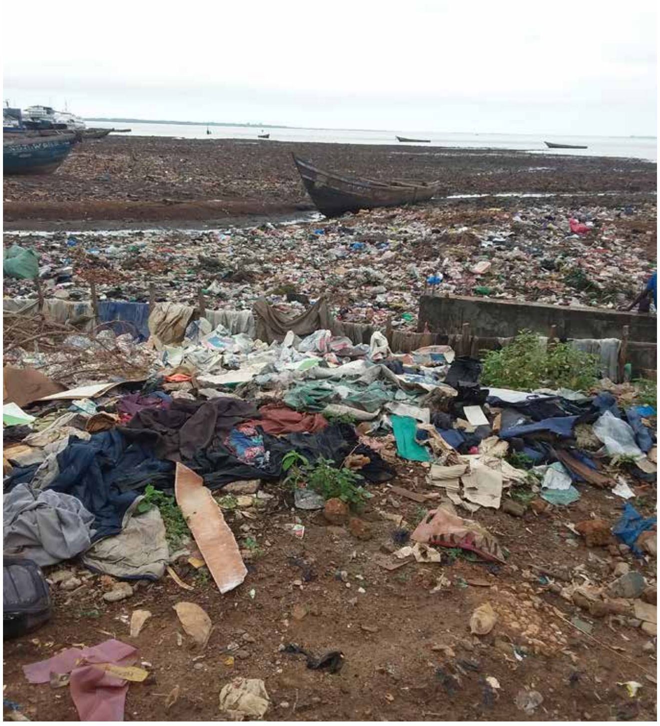
- There were no data on the most common activities conducted by member states within each sector.
- No information was available on the type and volume of losses in the environment (including microplastics).
- No details on preventive or mitigation measures (including policy measures and best practices) were available.

4.2 Pathways and distribution

4.2.1 Pathways

Litter enters and moves around the environment through numerous pathways, all of which contribute to the global issue of marine litter (Ryan et al. 2009; Auta, Emenike and Fauziah 2017; Diop and Scheren 2016; Bravo et al. 2009; Kuo and Huang 2014):

- Legal and illegal dumpsites
- Waste carried by river systems and floodwaters
- Industrial outfalls and discharges from stormwater drains
- Untreated municipal sewage and discharges from shipping and port activities



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- Waste transported from distant marine locations through ocean currents
- Beach litter that is washed or blown out to sea, the density of which may be linked to the number of tourists and the frequency of beach cleaning

Regarding stormwaters, studies in southern California found the density of debris after a storm to be seven times higher, while the weight of plastic litter was found to increase more than 200 times following a storm in Santa Monica Bay (Moore et al. 2002; Lattin et al. 2004). In the Democratic Republic of Sao Tome and Principe, which receives 1,000–7,000 mm of rainfall per year, large amounts of litter are washed into the sea after heavy rain downpours (Giardino et al. 2012). This finding was supported by the workshop participants (GRID-Arendal 2020).

In terms of river systems, there are 63 major transboundary river basins in Africa (Southern African Research and Documentation Centre et al. 2012), most of which discharge their water and litter into the Atlantic and Indian oceans. Major river systems that enter the Atlantic Ocean from Africa include the Congo, Gambia, Niger, Sanaga, Senegal and Volta river basins. The participants of the regional workshops which supported this desk study identified major settlements, such as Brazzaville and Kinshasa on either side of the Congo River, as potential land-based sources of marine litter (GRID-Arendal 2020). Brazzaville and Kinshasa are populous cities with 2.23 million and 13.17 million residents, respectively (UNEP 2017a). Similarly, workshop participants identified Banjul – which is located on an island where the River Gambia meets the Atlantic Ocean – as another location where marine litter enters the ocean (GRID-Arendal 2020). Finally, the Niger River has one of the highest levels of plastic pollution in the world, discharging close to 2 million tons a year (Schmidt, Krauth and Wagner 2017).

Factor influencing marine litter distribution

The spatial distribution of marine litter is influenced, among other things, by anthropogenic activities, hydrographic and geomorphological factors, as well as prevailing winds, and entry points.

Some marine litter also finds its way into the ocean after being dumped by residents of the settlements along the western coast of Africa, whose large cities include Abidjan, Accra, Cape Town, Casablanca, Conakry, Cotonou, Douala, Freetown, Lagos, Lomé, Luanda, Monrovia, Port Harcourt and Rabat (Abuodha 2009). Higher densities of debris in coastal waters are often associated with human population density (Lebreton, Greer and Borrero 2012). The presence of urban-industrial centres is also a contributing factor. Industrial pre-production pellets are the most abundant type of plastic debris found in South Africa, but they are confined to a few hotspot beaches and are concentrated around urban centres (Ryan et al. 2018).

Finally, it should be noted that vessels can be discarded directly into the oceans for various reasons, including deliberate sinking, poor weather, war or instability due to incorrect loading of cargo or poor design, presenting a new sea-based source of litter (Kamm 2014). There are thought to be more than 2,700 vessels wrecked along the coast of southern Africa, some of which are more than 500 years old, dating back to a time when Portuguese explorers were searching for a sea route to the east (Kamm 2014).

4.2.2 Distribution

Plastic debris was first reported in the oceans in the early 1970s (Carpenter and Smith 1972; Colton, Burns and Knapp 1974). The spatial distribution of marine litter is influenced by anthropogenic activities, hydrographic and geomorphological factors, as well as prevailing winds, and entry points (Derraik 2002; Barnes et al. 2009). Generally, the distribution and composition of marine litter floating at sea depend largely on near-shore ocean circulation patterns, although they are also affected by prevailing winds (Aliani, Griffa and Molcard 2003; Thiel et al. 2003; Lattin et al. 2004; Ribic et al. 2010). For example, larger volumes of plastics have been observed at sites downwind (Browne, Galloway and Thompson 2010; Collignon et al. 2012). While the world's oceans contain many different types of litter, plastics are by far the most abundant material recorded. Plastic litter makes up 80–85 per cent of marine litter and is the fastest growing type (Auta, Emenike and Fauziah 2017). Marine plastic often breaks up into microplastics, which are dispersed by ocean currents (Eriksen, Thiel and Lebreton 2016). The physical properties of the different types of plastic litter and microplastics determine their distribution and dispersal (UNEP 2016a).

In the open oceans, the spatial patterns of litter are influenced by the interaction of large-scale atmospheric and oceanic circulation patterns, leading to elevated accumulations of floating litter in the subtropical gyres (Martinez, Maamaatuaiahutapu and Taillandier 2009; Goldstein, Rosenberg and Cheng 2012; Howell et al. 2012). Indeed, some of the most substantial accumulations of debris can now be found in oceanic gyres far from land (Eriksen et al. 2014).

Models suggest that marine debris deposited in coastal zones can accumulate in the central oceanic gyres within two years from deposition (Martinez, Maamaatuaiahutapu and Taillandier 2009). This persistent floating litter will accumulate in mid-ocean subtropical gyres, forming so-called “garbage patches” (Kaiser 2010; Lebreton, Greer and Borrero 2012). Similarly, accumulations of marine plastic and microplastic debris have also been found in other marine environments, including the Mediterranean Sea, the Bay of Bengal, the South China Sea and the Gulf of Mexico (Cózar et al. 2015; Lebreton, Greer and Borrero 2012). Finally, recent research highlights that the Arctic Ocean may be a hotspot for marine plastic litter and microplastics (Obbard et al. 2014; Cózar et al. 2017; PAME 2019).

While some types of marine litter tend to sink to the sea-floor or wash up on beaches, a significant proportion remains suspended and can circulate in the oceans for long periods of time (National Oceanic and Atmospheric Administration Marine Debris Program 2016). Recent studies have shown how litter is further redistributed by marine fauna and then ingested (from microorganisms to megafauna) (Cózar et al. 2014; Cole et al. 2016; Rummel et al. 2016). Other research has found that more than 99 per cent of the litter that has entered the oceans since 1950 is now below the sea surface, with large amounts of marine plastic and microplastic litter found in the deepest known marine area of the Mariana Trench (Koelmans et al. 2017; Chiba et al. 2018). Plastic particles may follow a number of different pathways – particles composed of polymers with a density greater than seawater will sink to the sea-floor and become buried in sediments. Less dense particles will float until their surfaces become colonized by marine life, causing them to slowly sink to the sea-floor. It was estimated by Koelmans et al. (2017) that if plastic were to be stopped from entering the ocean, most plastic particles would sink to the sea-floor within three years. Microplastic particles are also consumed by zooplankton and expelled as faecal pellets (Cole et al. 2016) or exported to the sea-floor either through flocculation or by sinking as aggregates (Jambeck et al. 2015; Bergmann et al. 2017; Michels, J. et al. 2018). It has been proposed that bottom currents may concentrate sinking plastic particles into deep ocean trenches and submarine canyons (Ballent et al. 2013; Kane and Clare 2019).

Both ocean currents and the buoyancy of debris play a part in the transport and movement of marine litter. Isolated islands in the Atlantic Ocean receive significant amounts of transboundary plastic debris (Lavers, J.L. et al 2017). It has also been shown that oceanic currents have transported plastic octopus and oyster traps used for artisanal fishing in Mauritania and Morocco as far as the coastlines of the Bahamas, Bermuda, Brazil and El Salvador (Ambrose et al. 2019) as confirmed by the workshop participants (GRID-Arendal 2020). Similarly, plastic octopus traps accounted for 95 per cent of marine litter collected during a study on trawlers in waters off the Moroccan coast (Loulad et al. 2016). This type of marine litter can be attributed to defective fishing lines, poor weather, illegal fishing, vandalism and theft (Loulad et al. 2016; Ambrose et al. 2019).

Other factors that affect the spatial distribution of plastic debris include land uses, the human population, and fishing activity (Ribic et al. 2010). For example, hotspots of fishing-related debris have been found close to harbours or fishing communities and coastal waters lead to submarine canyons, which channel waste (including plastic litter) originating from land-based activities to coastal areas into the deep sea. Coastal waters can also host aquaculture, fisheries, harbours, commercial fishing, and other marine-related human activities which can contribute towards the marine litter burden (UNEP 2016a).

4.2.3 Classification of solid waste: Morocco case study

In October 2014, researchers working with the National Institute of Fisheries Research of Morocco conducted a scientific trawling survey of the southern Moroccan Atlantic Ocean, inspecting 100 station points randomly located at depths of 0–150 m (Loulad et al. 2016). Their study analysed the spatial distribution of solid waste in this area, classifying the waste collected as plastic, glass, metal, anthropogenic wood, textiles (fabric or fibre) and rubber. The categories were used to classify waste based on quantity and weight, with plastics reported as the most common items found. By weight, plastic comprised 34.4 per cent of collected waste, followed by metal (29.16 per cent), textiles (29.15 per cent), rubber (0.77 per cent) and glass (0.16 per cent). In terms of the quantity of waste, plastic items comprised 83.61 per cent, followed by metal (7.5 per cent), textiles (7.16 per cent), rubber (12.21 per cent) and glass (0.34 per cent). Furthermore, octopus traps (a form of ALDFG) made up 95.44 per cent of the 83.61 per cent of plastic items, while the remaining items were plastic bottles and plastic bags. The authors note that waste accumulation is linked to the proximity of artisanal fishing waters and the circulation of currents. No industrial activities are carried out in the southern region of Morocco and only artisanal fishing of cephalopods takes place there, within a delimited zone of between three and eight nautical miles from the coastline, where each boat is allowed to lay 300 pots at a time (Loulad et al. 2016; GRID-Arendal 2020). The authors of the study claim that artisanal fishing practices are the main source of this marine litter. Nonetheless, there are other sources, such as public landfill sites located near the coastline. According to the subregional workshop participants, illegal industrial vessels and trawlers are known to work in this coastal area and damage the octopus trap lines of artisanal fishers. These damaged fishing lines then become detached, broken and consequently lost, becoming a source of marine litter (GRID-Arendal 2020).

5. The impacts of marine litter

Marine litter originates from many sources and has a wide range of environmental, economic, safety, health and cultural impacts. It impacts the entire food web and our societies. Environmental impacts of marine litter include wildlife entanglement and ingestion and habitat damage. Marine litter is also an eyesore, degrading the beauty of the marine and coastal environment and potentially impacting tourism, commercial fish stocks and other ecosystem services, with substantial economic costs incurred. In recent years, the existence of microplastics and their potential impact on wildlife and human health has received increased public and scientific attention. In order to understand the socioeconomic and environmental impacts of marine litter and microplastics, many studies have quantified their presence in the marine environment. So far, few studies consider the impact of these quantities on the biota itself, let alone the impact of population levels on their associated communities and the functioning of entire coastal ecosystems. Similarly, not much is known about the economic and societal impacts of marine litter, but the available data suggest that the effects are significant (Galgani, Hanke, and Maes 2015).

Marine Litter Impacts

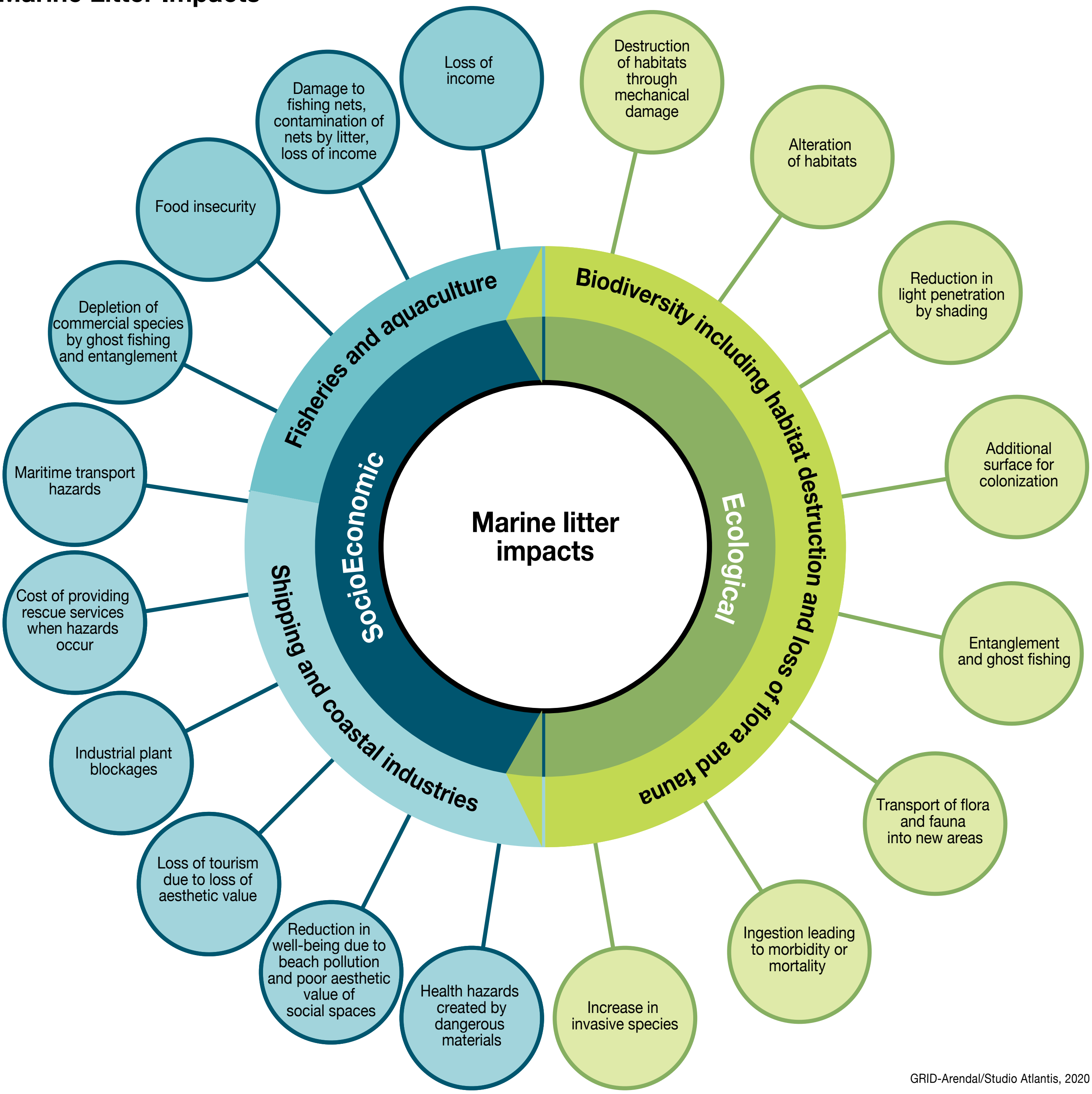

Figure 11. *Summary of the impacts of marine litter identified by the workshop participants*

5.1 Interactions with biota and ecological impacts

The large marine ecosystems (LMEs) of the West, Central and Southern African coasts are globally recognized as some of the most productive in the world. The Canary, Guinea and Benguela currents support biodiversity that in turn supports local communities' livelihoods and forms the basis of the blue economy in the region (UNEP 2016).

These coastal regions host critical natural resources providing numerous ecosystem services from natural shoreline protection to food security. Large migratory natural processes take place in the region, which is also home to thousands of species that take advantage of its rich ecosystem biodiversity featuring cold-water coral reefs, seagrass meadows, mangrove forests, and coastal wetlands and lagoons (World Bank Group West Africa Coastal Management Program 2016).

The coast of West, Central and Southern Africa contains approximately 14 per cent of the world's mangrove area (UNEP and GRID-Arendal 2016). A UNEP socioeconomic survey (UNEP 2016b) determined the value of some of the ecosystem services in the region, finding that the regulation of ecosystem services provided by mangroves in the West and Central African coastal region can be valued at an estimated US$ 63.2 million for sewage treatment plants, US$ 1.7 million for coastal protection and over US$ 373 million for annual carbon sequestration. Similarly, habitat services provided by mangrove and seagrass fish nurseries was estimated at US$ 1.8 billion to directly support the local fisheries sector and its 5.5 million workers (FAO 2020).

The workshop participants from Ghana, Morocco and Namibia (annex II) also mentioned other environmental impacts of marine litter caused by inefficient waste management systems:

- Loss of biodiversity due to entanglement, ingestion, and asphyxiation, not only of marine wildlife but also domestic land-based animals, such as goats, sheep and cows
- Becoming a vector for transporting invasive or non-endemic species
- Contamination, damage, and destruction of habitats

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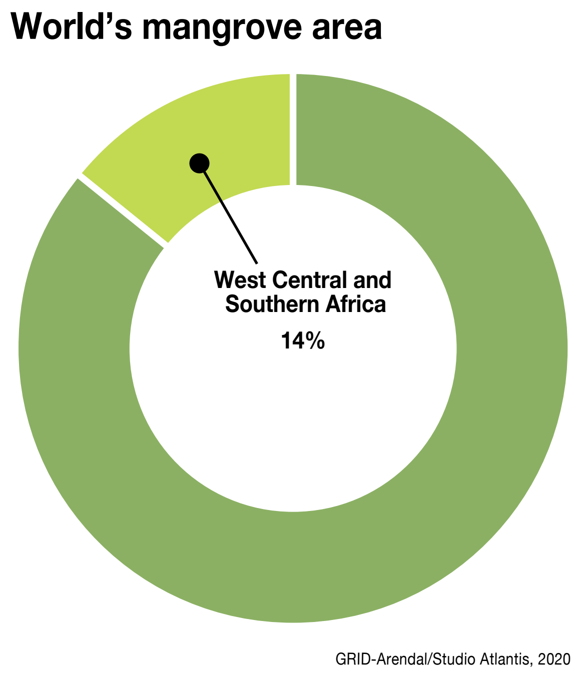

Figure 12. *World´s mangrove area*

- Transfer of chemical pollutants through the marine food chain
- Reduction of mangrove ecosystems
- Reduction of fish stocks due to the destruction of habitats and spawning grounds
- Damage to aquatic ecosystems due to the smothering effect of marine litter preventing photosynthesis.

Another important service highlighted in this report is local culture and tourism, as ocean and coastal ecosystems are integral to tourism services, representing around 70 per cent of national tourism incomes, with the Guinea current LME alone having a value of US$ 720.8 million per year (UNEP 2016). Furthermore, biodiversity and cultural services are estimated to provide over US$ 55 million to the Guinea and Canary Current LME regions (UNEP and GRID-Arendal 2016).

Marine litter is ubiquitous in all freshwater and marine ecosystems and poses many threats to ecosystems, biodiversity, and organisms, regardless of its location and size (UNEP 2016a; UNEP 2017b).

The two most visible environmental impacts of marine litter are the entanglement of, and ingestion by, marine wildlife. These environmental impacts are, in turn, known to have lethal or sub-lethal impacts on a wide range of marine species, including invertebrates, fish, turtles, seabirds and mammals, by altering their biological and ecological performance. The sub-lethal impacts of entanglement and ingestion have the potential to impair marine animals' ability to catch food or feed themselves, feel hunger, move, evade predators, migrate or reproduce and can ultimately lead to death (Macfadyen, Huntington and Cappell 2009; Gall and Thompson 2015; UNEP 2016a). Nonetheless, the extent of the impact of long-term microplastic exposure on organisms and ecosystems needs to be better understood (World Health Organization 2019). The same can be said of the long-term effects of ingestion – they too are not fully understood and determining them can also be difficult.

Ecological impacts of marine litter

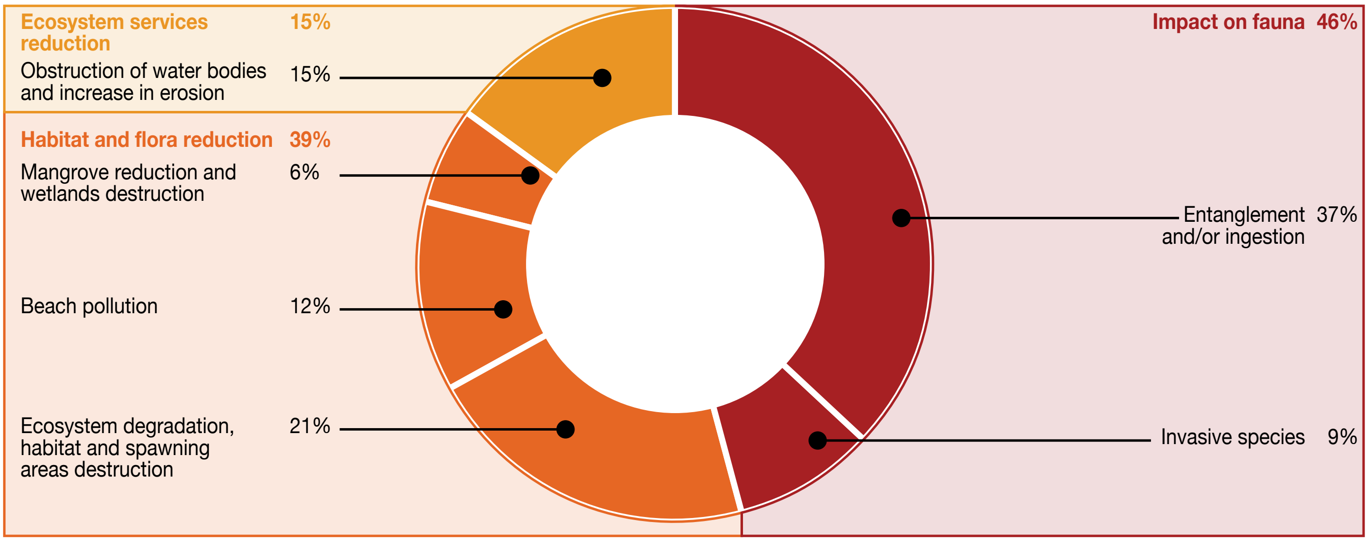

Figure 12. *Proportion of workshop participants identifying certain categories as ecological impacts of marine litter*

However, an increased mortality in oysters who were chronically exposed to microplastic was observed in a laboratory (Maes et al. 2019).

5.1.1 Ingestion

The ingestion of plastic litter and microplastics is well documented in other parts of the world (Ryan 2008; Setälä, Fleming-Lehtinen and Lehtiniemi 2014; Cole et al. 2016; Rummel et al. 2016; Cheung, Lui and Fok 2018). In some cases, this has been attributed to its resemblance to food (Schuyler et al. 2016; Chagnon et al. 2018). More research is needed within the West, Central and Southern African Region, as most of the scientific literature available to date comes from research carried out in South Africa.

Migratory organisms, such as sea turtles, that cross ocean gyres, entering regions that due to current dynamics have a high aggregation of marine litter and microplastics, may be more likely to ingest debris (Eriksen, Thiel and Lebreton 2016). Ryan et al. (2016) studied the incidence of plastic ingestion by post-hatchling loggerhead turtles found stranded (both alive and dead) on the South African Coast during 2015. They found that 60 per cent of the turtles that died within two months of their arrival had plastic in their stomachs. Furthermore, 90 per cent of the items found in their stomachs were marine litter and microplastics, including hard plastic fragments (79 per cent), flexible packaging (10 per cent), fibres (8 per cent) and industrial pellets (3 per cent). The authors concluded that plastic ingestion was the direct cause of death for 48 per cent of the turtles and a contributing factor in the death of a further 22 per cent. The surviving turtles, which were rehabilitated, also contained plastic in their stomachs but eventually egested these items. Both retention and subsequent egestion of plastic debris were found to cause ruptures to the bladder, widen the cloacal vent and lead to the accumulation of necrotic material within the cloacal area. The authors also highlighted that hatchlings were underweight and exhibited low growth rates while in captivity.

The study also showed that hatchlings mainly ingested plastic that floats on the water's surface (Ryan et al. 2016), while adults could ingest plastic present throughout the water column, showing how plastic litter can affect a species differently throughout its life cycle.

Intergenerational transfer of plastic litter from several seabird species to their offspring has been reported in South Africa (Ryan 2015). A recent study in the Canary Current has documented shearwaters (*Calonectris diomedea*) ingesting and transferring plastic items to their fledglings. The reported consequences of this plastic litter ingestion for both parents and offspring include perforation, ulceration, reduced space for food, weakness, and starvation (Rodríguez, Rodríguez and Nazaret 2012). These studies highlight the significant risk posed by plastic to populations whose survival is threatened by anthropogenic pressures throughout their life cycle. Similarly, albatrosses and seals from three islands in the South Atlantic Gyre (one of the five subtropical gyres where plastic litter accumulates) were found to have ingested marine litter including derelict fishing hooks, hooklengths and other plastic items (Ryan, de Bruyn and Bester 2016). Microplastics were also found in three commercially significant small pelagic fish species in South African waters, namely the European anchovy (Engraulis encrasicolus), the west coast round herring (Etrumeus whiteheadi) and the South African sardine (Sardinops sagax) (Bakir et al. 2020).

Reefs holding microplastics in their tube structures have only recently become the subject of research, with topics including microplastic ingestion by Scleractinian corals

> The ingestion of plastic litter and microplastics is well documented in other parts of the world. However, more research is needed within the West, Central and Southern Africa region.

in Australia (Hall et al. 2015), the impacts of microplastic ingestion on the calcification of reef-building corals in the Caribbean (Zink and Smith 2016) and laboratory experiences examining the responses of different types of reef-building corals to microplastic exposure (Reichert et al. 2018). A study reported that coastal sediments act as major marine litter sinks (Harris 2020) and noted that “diatoms, hydroids, and goose barnacles utilize plastic as a substrate for attachment, resulting in increased opportunities for widespread dispersal” (Nel and Froneman 2018). Like marine ecosystems, freshwater ecosystems are also impacted by plastic debris. Water bodies within densely populated metropolitan areas have been found to carry large amounts of debris, microplastics and microfibres. The faeces and feathers of seven South African bird species living in freshwater systems have also been found to contain microplastic fibres (Reynolds and Ryan 2018).

5.1.2 Entanglement and obstruction

The entanglement of animals is one of the most visible consequences of marine litter and has been widely documented around the world. The majority of the debris that leads to entanglement in marine ecosystems comes from abandoned, lost or otherwise discarded fishing gear, or “ALDFG” (Macfadyen, Huntington and Cappell 2009). Its consequences vary depending on the type of gear. From 1996 to 1997, a total of 393 seabirds from nine different species were found dead on the Prince Edward Islands in South Africa after becoming entangled in longline fishing gear (Ryan 1999). Another study carried out in Mauritania and Spain found decreased flight mobility and foraging ability in seabirds, leading to their debilitation and starvation (Rodríguez et al. 2013). The study also noted that entanglement can cause deformation and fragmentation of the beak and feet.

> The majority of the debris that leads to entanglement in marine ecosystems comes from abandoned, lost or otherwise discarded fishing gear.

Birds have also been found to use plastics to build their nests. For example, in South Africa, kelp gulls (Larus dominicanus) near urban areas and landfills have been found to be more likely to use marine litter (Witteveen, Brown and Ryan 2017). Plastic items found in their nests included flexible packaging, fishing lines and ropes. The authors of this study argue that it is also possible that this material is regurgitated debris. They point out that the presence of litter in nests increases the chances of ingestion by hatchlings.

Furthermore, on coastlines, marine litter acts as an obstacle for sea turtle hatchlings by increasing the amount of time they spend crawling into the sea. Research conducted on the islands of Cabo Verde found that the longer hatchlings spend outside water, the longer they are exposed to predators, reducing their chances of survival (Aguilera et al. 2018).

5.1.3 Pollutants

Plastics contain additives, often toxic compounds that are added during the manufacturing process to improve the characteristics of the end product. These additives can leach out rapidly into the oceans, while other hydrophobic compounds are absorbed from the surrounding seawater, including persistent organic pollutants, such as polychlorinated biphenyls and dichlorodiphenyltrichloroethane. These compounds have endocrine-disrupting effects and, if ingested, the plastics could transfer these compounds through the food chain (Secretariat of the Convention on Biological Diversity 2012; Lynn, Rech and Samwel-Mantingh 2016). Experiments have shown that endocrine disruptors like phthalates and bisphenol A affect reproduction in crustaceans and amphibians, inducing genetic aberrations. Concentrations of the substances studied in the laboratory have also been found in the marine environment, meaning they could potentially be affecting natural marine populations (Secretariat of the Convention on Biological Diversity 2012).

Globally, between 1.15 and 2.41 million tons of plastic waste enter the ocean through rivers every year (Lebreton et al. 2017). There is evidence to suggest that microfibres from polyester and acrylic fibres from sewage (wastewater from domestic washing machines) may be one of the biggest contributors of microplastics to the marine environment (Browne et al. 2011), after automotive tyres and plastic pellets (Hann et al. 2018). These microfibres accumulate worldwide in sediments on riverbanks, estuaries and shorelines, as well as on the seabed (Browne et al. 2011; Woodall et al. 2014; Lourenço et al. 2017; Maes et al. 2017). The volumes of microfibres released into the natural environment vary by region. The use of washing machines increases the release of fibres from textiles. Sewage treatment plants can prevent microplastic input into the natural environment (Siegfried et al. 2017). The presence of microfibres has been documented in environments ranging from remote intertidal wetlands to deep-sea sediments (Taylor et al. 2016; Lourenço et al. 2017). The high level of accumulation of plastic litter in estuaries and wetlands is due to the low velocity of water and the ability of these environments to act as dumpsites for sewage (Lourenço et al. 2017; Harris 2020). Microfibres have been found in 11 shorebird species and macroinvertebrates in three areas in the Eastern Atlantic (the archipelago of Guinea-Bissau, Mauritania, and Portugal, including the drainage basin

> As well as leaching additives into the marine environment, plastics absorb persistent organic pollutants (POPs) such as polychlorinated biphenyls (PCBs) and metals from surrounding seawater.
>
> There is evidence showing that ingested plastics can transfer pollutants and chemical additives to tissues. But overall, the flux of hydrophobic organic chemicals bioaccumulated from natural prey overwhelms the flux from ingested microplastic for most habitats.

for waters from Guinea and Senegal) were found to contain plastic pollutants, which may have come from plastic present in their prey (Lourenço et al. 2017). Similarly, predatory porbeagle sharks from the North East Atlantic have been found to contain large amounts of microplastics, including fibres, in their spiral valves. These ingested plastic particles, found in their prey, most likely bioaccumulate and form a pathway for the entry of chemical contaminants into an already critically endangered species (Maes et al. 2020).

As well as leaching out additives into the marine environment, plastics absorb persistent organic pollutants (POPs) such as polychlorinated biphenyls (PCBs) and metals from surrounding seawater (de Frond et al. 2019). Over time, microplastics can accumulate high concentrations of these POPs, but this does not mean microplastics are necessary for the global dispersion of POPs. The release and adsorbance of substances into the natural environment is facilitated by various physical and chemical processes leading to an equilibrium. Therefore, plastics are an important vector for additives (for example, flame retardants) which leach out polymers upon arrival in the marine environment, but limited evidence exists to prove that microplastics act as an important transfer vector of POPs into animals (Lohmann 2017). Desorption rates were faster with changing pH and increasing temperature, meaning warm-blooded organisms at the top of the food chain could be more affected (Bakir et al. 2014). In most cases, however, ingestion of microplastic does not provide a quantitatively significant additional pathway for the transfer of adsorbed chemicals from seawater to biota via the gut (Bakir et al. 2016). Overall, the flux of hydrophobic organic chemicals (HOCs) bioaccumulated from natural prey overwhelms the flux from ingested microplastic for most habitats, which implies that microplastic ingestion is unlikely to increase the exposure to, and therefore risks of, HOCs in the marine environment (Koelmans et al. 2016). Depending on the equilibrium that will set in, plastic is more likely to act as a passive sampler than as a vector of POPs (Herzke et al. 2015).

There is evidence to show that ingested plastics can transfer pollutants and chemical additives to tissues. Experiments have exposed lugworms, both via ingestion and tissue exposure, to sand with 5 per cent of microplastics presorbed with nonylphenol and phenanthrene (used as additives in polyvinyl chloride) and triclosan and PBDE-47 (additives for plastic products) (Browne et al. 2013). The results found that not only did the lugworms ingest the polluted microplastics but that the intake harmed their ability to feed, damaged their immunity and reduced their antioxidant capacity, seriously reducing their ability to survive. Tissue exposure to triclosan resulted in a 50 per cent increase in death.

In 2008, a study on plastics floating at the surface of the Atlantic and the South-West Indian Ocean differentiated between virgin pellets and secondary plastics. The study authors observed a decrease in the presence of virgin pellets and an increase in secondary plastics in the guts of five species of seabirds, raising the question of a decrease in the virgin pellet density at sea, or conversely, an increase in the secondary plastic particle density at sea (Ryan 2008).

Despite the existence of marine protected areas, transboundary marine litter can still pose a threat. For example, the Rocas Atoll in the Atlantic Ocean, which is a circular reef located in a protected area, has been deprived of light by marine litter accumulations, causing the ecosystem to suffer from anoxia and increased levels

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of toxins. The combination of warming oceans, rising sea levels and ocean acidification increases the prevalence of diseases after periods of thermal stress (de Oliveira Soares 2018). Another study in the Atlantic Ocean compared the concentration of microplastics in three of the Canary Islands, each island with different local governments, but the same national and regional governments (Baztan et al. 2014). The results showed that plastic pollution comes from human production, consumption and disposal, as well as transport and degradation in natural systems. Microplastics also act as vectors for metals and other contaminants present in open surface waters. The authors of the study found that the microplastics that are loaded with metals can be ingested by fauna and carry other poisonous chemicals, such as the additive bisphenol A (BPA), which causes endocrine disruption and prenatal phthalate exposure in humans. They also note that plastics can act as vectors for pathogens to enter the food chain, for example, through ingestion of molluscs and fish, and biofilm formation in plastics which can increase the spread of bacteria.

5.2 Socioeconomic impacts

The marine environment is home to many activities around the world, including swimming, fishing, diving, shipping, and tourism. These activities have many social and economic benefits and are of significant economic value in many countries. However, they can be substantially affected by the presence of marine litter, leading to a decrease in socioeconomic value (UNEP 2017c). Not only does the increase in marine litter impact the ecosystem and its ecosystem services, it also has an impact on the well-being of humans and the economy (Newman et al. 2015). Moreover, impacts of marine litter can be transboundary in nature, resulting in costs to countries where waste may not necessarily have originated (Secretariat of the Convention on Biological Diversity 2012; Ambrose et al. 2019) In recent years, marine litter has attracted attention throughout the world, largely due to its impact on marine biota. However, its social and economic impacts are not well understood.

This section focuses on the socioeconomic impacts of marine litter, as knowledge gaps exist in this area. Most countries in the West, Central and Southern African Region have little to no literature on this subject available, with the little that does exist mainly coming from South Africa. To fill this gap, meaningful international literature has been referenced where available. A cost-benefit analysis including aquaculture, tourism and clean-ups showed that approximately GBP 250 million could be saved if microplastics were not present in the seas surrounding the United Kingdom (Van der Meulen et al. 2014). Both the study by Mouat, Lozano and Bateson (2010) in Shetland and the study by Van der Meulen et al. (2014) in the Channel and France Manche Region identified a number of specific social and economic impacts associated with marine litter, including the loss of aesthetic value, public health and coastal water quality, safety risks, hazards to swimmers, the costs of cleaning up litter and a decrease in tourism, as well as aquaculture-related impacts involving microplastics. The subsections that follow are based on these studies.

5.2.1 Social impacts

The social impacts of marine litter are the ways in which this litter affects human well-being, ranging from reduced enjoyment of recreational activities to loss of aesthetic value (Mouat, Lozano and Bateson 2010). Due to their small size and potentially high bioavailability to a wide range of marine organisms, marine plastic and microplastic litter may have an impact on public health and safety (Van der Meulen et al. 2014), for example, by injuring beach users or leaching chemicals into the natural environment, as well as by creating navigational hazards, which can, in turn, cause damage to vessels (discussed in the next subsection) and jeopardize the safety of people on board. Nonetheless, incidents related to marine litter often go unrecorded, making it difficult to assess the extent of this problem. Collisions with large items of marine litter can lead to major injuries or even death for sailors and fishers (Mouat, Lozano and Bateson 2010; Newman et al. 2015).

Major economic impact of marine litter

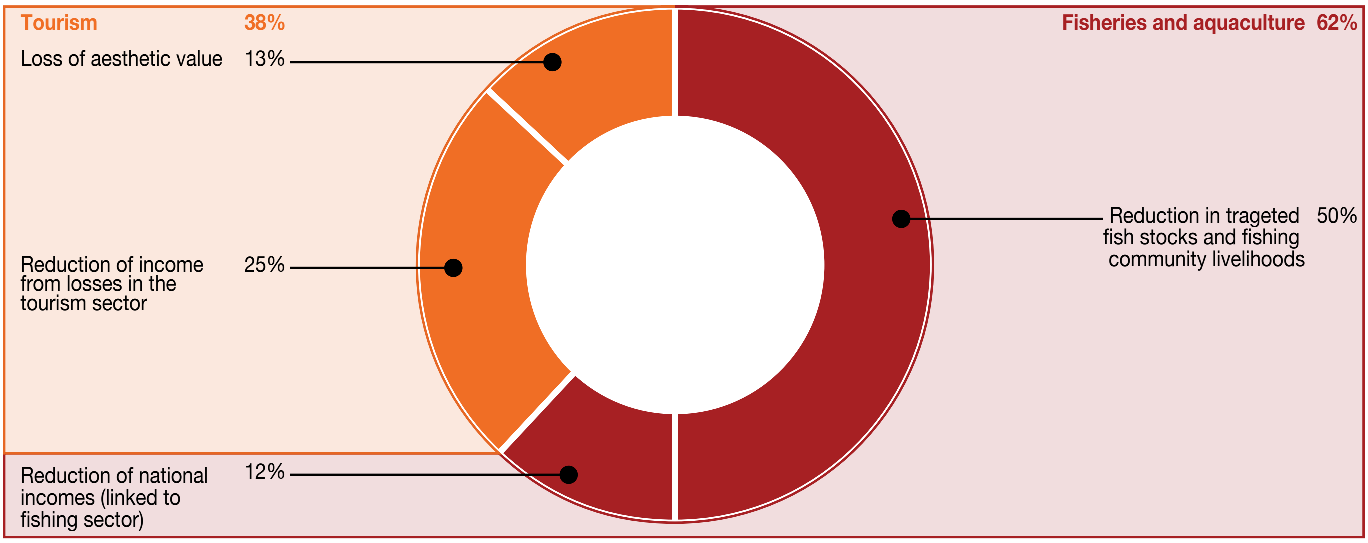


Figure 13. *Proportion of workshop participants identifying certain categories as socioeconomic impacts of marine litter*

Health:
Humans can be exposed to plastic particles via consumption of contaminated products, drinking water and/or via the air. Plastics can also act as vectors for viral and bacterial diseases.

Safety:
The impact of floods is exacerbated by plastic litter blocking waterways and safety mechanism.

Hazard:
The hazard to beach users, swimmers and divers remains understudied and while this means there is a lack of information on the extent of these injuries.

Loss of non-use value, aesthetic value and cultural services
Global studies have found that visiting the coast can improve people's mood and cognitive attention. But so far, no studies showing this impact could be found for the West, Central and Southern African Region.

Recreational activities
The presence of marine litter has the potential to cause significant damage to the tourism sector.

Navigational hazards
While marine litter can affect navigation in multiple ways, discarded fishing gear, such as nets, ropes, and fishing lines, tends to present the greatest risk.

The subregional workshop participants identified chemical and water contamination, the spread of diseases and food safety and security as the major human-health-related impacts of marine litter. Based on several studies, other potential impacts include ingestion of microplastic particles, endocrine disruption and reproductive issues. These hazards are supported by evidence of chemical substances and potentially pathogenic microorganisms found in microplastic beach litter and proven transfers of microplastic to mussels and oysters cultivated in waters with a high concentration of microplastics (Van der Meulen et al. 2014), among other potential physical and chemical impacts (GESAMP 2015).

Transfer of chemical pollutants through the food chain
There are health risks associated with the transfer of plastic particles through the food chain. Plastics have been found in the digestive and gastrointestinal systems of animals, from the base of the food chain (zooplankton) to the top (mammals, including humans). Many of the affected species, such as fish and shellfish, form a direct or indirect part of our diet as humans: mesozooplankton ingest plastics which are then transferred to macrozooplankton, moving up the food chain (Lynn, Rech and Samwel-Mantingh 2016; UNEP and GRID-Arendal 2016). Crabs have been found to ingest plastics through mussels, and fur seals through lanternfish. Plastic particles have also been found in two species of shellfish farmed for human consumption and it has been estimated that the annual uptake of plastics from contaminated species by frequent shellfish consumers in Europe could be as high as 11,000 particles (Van Cauwenberghe and Janssen 2014; UNEP 2016a).

Humans can be exposed to plastic particles via consumption of contaminated food products, drinking water and/or via the air. Uptake of plastics by humans (and animals) can cause adverse health effects through at least three possible means: particle toxicity, chemical toxicity and/or pathogen/parasite transfer (Vethaak and Leslie 2016). In terms of seafood, humans are most likely to ingest microplastics through the consumption of invertebrate filter feeders such as mussels and shellfish, which are often eaten whole (Van Cauwenberghe and Janssen 2014; GESAMP 2015; Lusher, Hollman and Mendoza-Hill 2017). Ingested plastic can move from the gut to the mammalian lymphatic system, humans included, and while data for microplastics remain limited, this can result in gut infections or

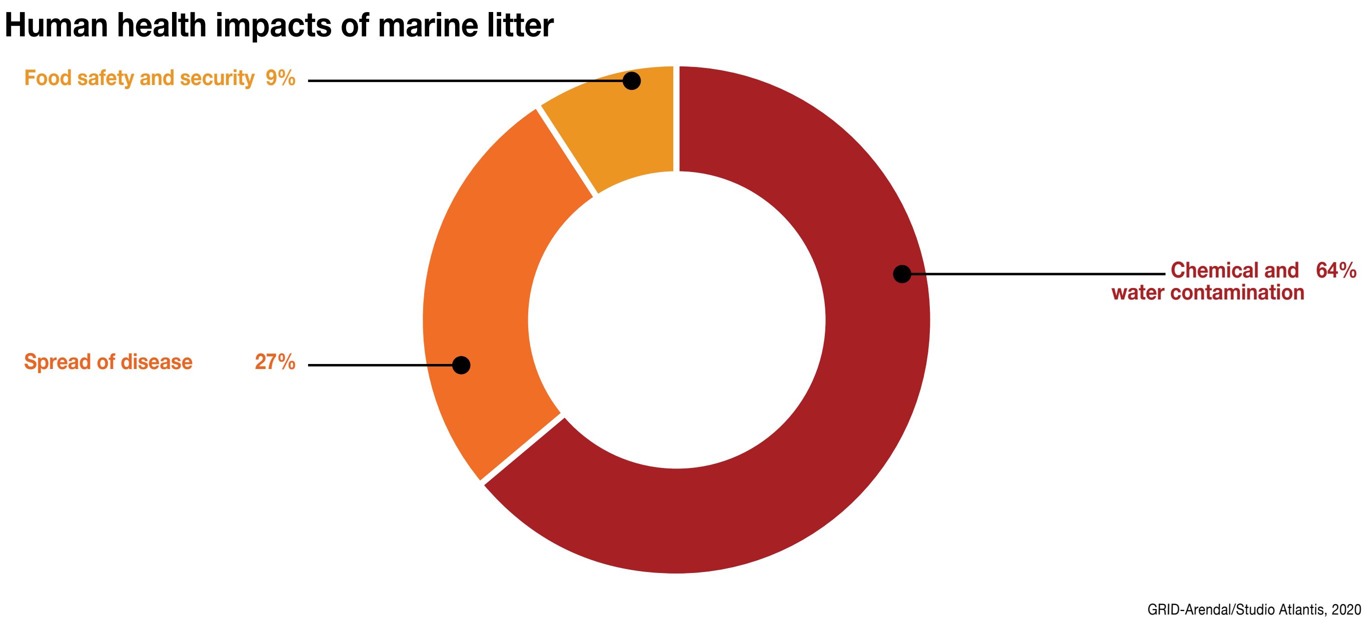


Figure 14. *Proportion of workshop participants identifying certain categories as human health impacts of marine litter*

immune stimulations emanating from the adhered molecule (Lusher, Hollman and Mendoza-Hill 2017). Nanoplastics have also been found to have the ability to pass through cell membranes, including the placenta, meaning that unborn foetuses become exposed to them (Lynn, Rech and Samwel-Mantingth 2016; UNEP 2016a). Basic knowledge regarding the consumption and potential impact of nanoplastics is still lacking but it is vital that we expand our knowledge in this area, as it could potentially have significant biological impacts (Lusher, Hollman and Mendoza-Hill 2017). Although the direct impacts of humans ingesting microplastics have not yet been confirmed, the increasing prevalence of microplastics is a cause for concern. A recent FAO publication urged seafood consumers to weigh up the protein and nutrient benefits of seafood against the ingestion of plastic particles (Lusher, Hollman and Mendoza-Hill 2017; World Health Organization [WHO] 2019).

Safety and spreading diseases

Plastics can act as vectors for viral and bacterial diseases in areas where they are not usually found and marine plastic and microplastic litter can develop into a habitat itself (the "plastisphere"), creating niches and supporting organisms different to those living in the surrounding environment (Zettler, Mincer and Amaral-Zettler 2013).

The impact of floods is exacerbated by plastic litter, since plastics clog drains, sewers, stormwater channels and waterways (Sambyal 2018). This was confirmed during the subregional workshops (GRID-Arendal 2020). The resulting floods adversely impact human lives, causing damage to property and infrastructure (Turpie et al. 2019). In Accra, Ghana, in 2015, plastic litter clogged drains during heavy rainfall, resulting in a flood that killed approximately 150 people (Sambyal 2018). In Bangladesh, the extent of the flooding problems caused by polythene plastic bags resulted in them being banned in 2002 (Ahmed and Gotoh 2005).

Another indirect impact of flooding caused by plastic litter is increased exposure to waterborne diseases. For example, on land and upstream, plastic bags tend to collect rainwater, making them perfect breeding grounds for mosquitos and consequently increasing the risk of spreading diseases such as malaria. Plastic litter has been found to be dominated by the bacteria that cause cholera and gastrointestinal diseases (Newman et al. 2015). Increased flooding in Kampala, Uganda has resulted in five cholera outbreaks between 1997 and 2008. Similarly, in Malawi, the risks of disease outbreaks increase considerably during the wet season due to improper waste disposal. In 2018, there were 929 cases of cholera recorded in the country, resulting in 30 deaths. The following year, 179 households were affected by flooding in the capital of Lilongwe, with an estimated death toll of two people (Turpie et al. 2019). A final unrecorded risk is the exposure to disease of informal waste pickers and homeless communities who sort litter on beaches or household garbage bags put out for collection. These disadvantaged communities face increased exposure to disease compared with the general population due to a lack of masks and protective gloves exposing them to cuts and toxic substances. This results in respiratory infections, skin diseases and mental illness triggered by social stigma (Made et al. 2020).

Hazards to beach users, swimmers, and divers

Marine litter, including discarded fishing gear such as nets and ropes, present serious hazards to swimmers and divers, who can become entangled in them and may struggle to free themselves. They can also reduce visibility, which creates an additional risk (Mouat, Lozano and Bateson 2010; Secretariat of the Convention on Biological Diversity 2012). In 2009, an experienced diver became entangled in a fishing net in Plymouth Sound in the United Kingdom, struggling for approximately 20 minutes to free himself. The net was 50 metres long and two metres high and also contained an entangled seal pup. It is probable that the net had travelled a considerable distance to the site where it was encountered by the diver, since nets are banned in the area.

On beaches, broken glass, fishing hooks and discarded medical syringes washing up on shore can all result in injuries to people, although these incidents are usually minor and tend to be self-treated. This field remains understudied and while this means there is a lack of information on the extent of these injuries, a recent study claims that marine litter on beaches poses a hazard to beach users of all ages (Campbell et al. 2019).

Loss of non-use value, aesthetic value and cultural services

"Non-use value" refers to the benefit a person derives from knowing that ecosystems, resources, or species exist or will be

Human health

Figure 15. *Impacts of marine plastic and microplastic litter on human health and society*

maintained in the future, regardless of whether that person actually visits, uses or experiences them first-hand (Mouat, Lozano and Bateson 2010; United Nations Department of Economic and Social Affairs [UNDESA] 2014). For example, there is a value associated with biodiversity derived from the satisfaction of knowing that certain species exist or will continue to exist for future generations. Although it is hard to quantify these impacts, this can be done by contingent valuation surveys designed to elicit people's "willingness to pay" to prevent environmental degradation. The closer a person feels to an environment, the deeper the loss felt if there is damage or degradation to it (UNEP 2016a). However, no studies showing this impact could be found for the West, Central and Southern African Region.

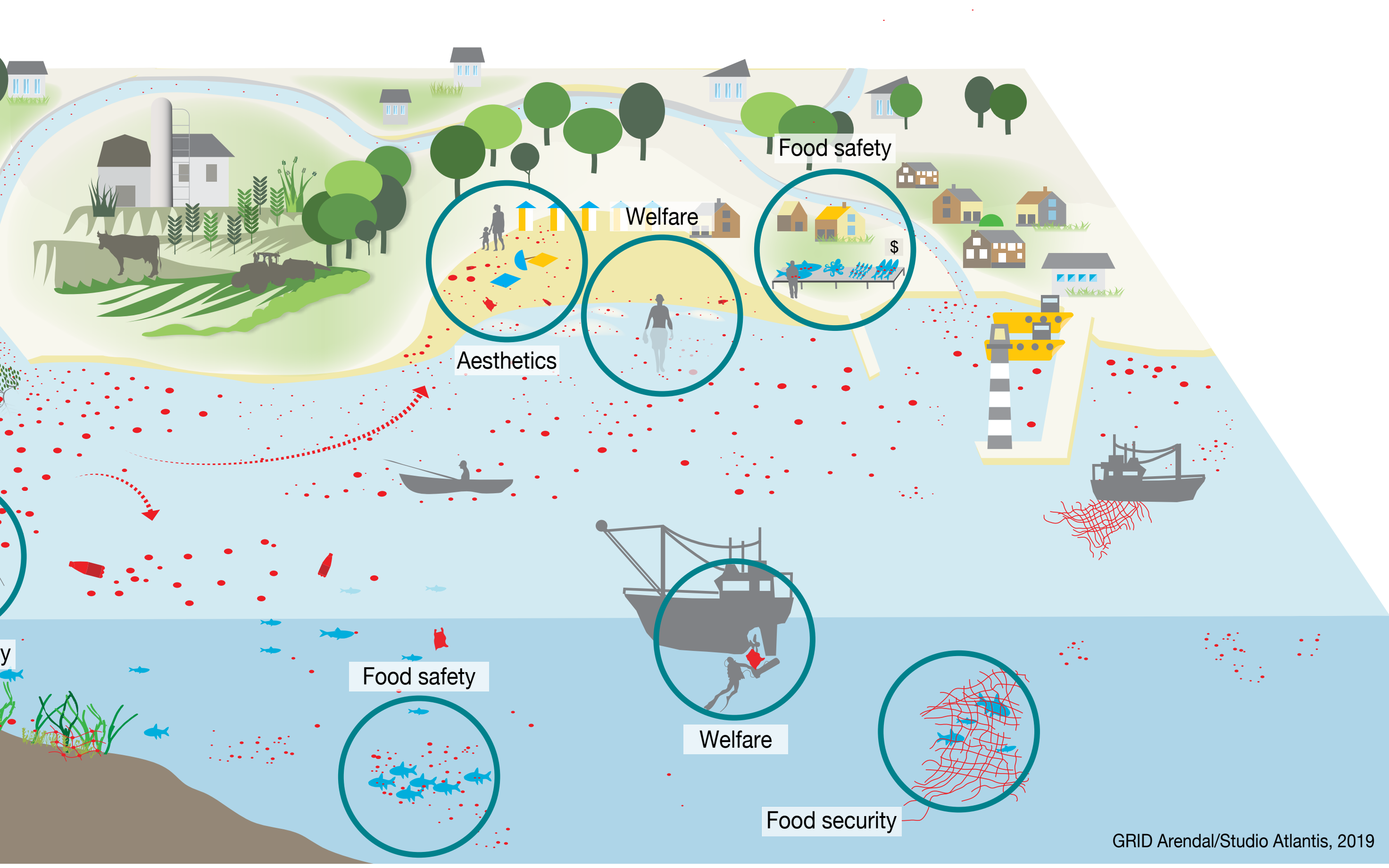
The concept of Blue Carbon science is also relevant here. It was initially used to describe the high contribution of coastal vegetation towards global carbon sequestration and it plays an important role in climate change mitigation and adaptation discussions. A lot of uncertainties remain in this field, particularly concerning the difference between accumulation in mature Blue Carbon ecosystems and those being restored, its value and potential costs due to the difficulty of restoring it once it is lost, and methods of enhancing its value in the future under climate stressors (Macreadie et al. 2019).

The presence of marine litter also affects people's enjoyment of the landscape and scenery, which are important aspects of quality of life. The loss of aesthetics can reduce the inspirational effect often provided by the marine environment (Cheshire et al. 2009; Mouat, Lozano and Bateson 2010). Studies have found that visiting the coast or just seeing images of the ocean can improve people's mood and cognitive attention. This can also improve health indicators, for example by reducing blood pressure. In contrast, the presence of marine litter can result in negative mood changes in individuals (GESAMP 2015). Marine litter has also been found to impact sailors and divers, from an aesthetic point of view, in addition to its associated health and safety risks (Mouat, Lozano and Bateson 2010). Studies on the impacts of marine litter on tourism, including some aesthetic aspects, have been carried out in South Africa. However, these studies focused more on the economic impacts and are discussed in more detail in the economic subsection.

Finally, the marine environment provides a valuable cultural contribution, and includes aesthetic, inspirational, spiritual, religious, and educational aspects, as well as a sense of place and cultural heritage (UNEP and GRID-Arendal 2016). No studies were found indicating impacts on these services in the West, Central and Southern Africa region.

Reduced recreational activities

Beaches and the oceans are used for multiple activities, including swimming, boating, diving, snorkelling, whale watching and fishing. Studies have shown that beach users rank cleanliness as a top priority when choosing a beach and that the accumulation of marine litter is a deterrent (Ballance, Ryan and Turpie 2000; Mouat, Lozano and Bateson 2010). Many countries



rely on the presence of healthy marine ecosystems, such as reefs, for ecotourism, which makes a significant contribution to the economy. Therefore, the presence of marine litter has the potential to cause significant damage to the tourism sector (Secretariat of the Convention on Biological Diversity 2012). A study in South Africa found that 85 per cent of beach visitors (both locals and tourists) would avoid a beach with more than two debris items per metre and 97 per cent would not visit a beach with 10 or more large marine litter items per metre (Ballance, Ryan and Turpie 2000).

Navigational hazards

While marine litter can affect navigation in multiple ways, discarded fishing gear, such as nets, ropes, and fishing lines, tends to present the greatest risk. Plastic bags can block water intakes, causing serious damage to pumps. Vessel propellers can become entangled and fouled, reducing stability and manoeuvrability, and collisions with marine litter can damage the propeller shaft, creating a hazard for the crew. Entanglement and fouling can result in divers needing to work close to the hull to remove litter, a task that can be dangerous in adverse sea conditions (Ten Brink et al. 2009; Mouat, Lozano and Bateson 2010; Secretariat of the Convention on Biological Diversity 2012).

In 2005, the US Coast Guard reported 259 boating incidents caused by collisions with submerged debris, resulting in 15 deaths and 116 injuries. In South Korea, during the period 1996–1998, 9 per cent of shipping incidents involved marine litter, including the capsizing of a ferry after its propellers became entangled in a derelict fishing rope, resulting in 292 deaths. There is an increased risk of injuries and deaths from entanglement while swimming or diving, especially when trying to rescue live entangled animals such as whales (Arcadis 2014; Watkins et al. 2015; UNEP 2016a).

5.2.2 Economic costs

The marine environment is used for many different activities, making it economically important for countries around the world (Newman et al. 2015). The estimated annual direct output impact (an economic indicator used to estimate the impacts of goods and services) for the Benguela Current Large Marine Ecosystem is US$ 602 million (UNEP and GRID-Arendal 2016). South Africa benefits the most from the maricultural and recreational fisheries sectors, while Namibia has the highest overall economic revenue from fisheries, estimated at US$ 313 million. The number of people employed within the Benguela Current Large Marine Ecosystem is highest in Angola and South Africa (UNEP and GRID-Arendal 2016).

Marine litter can have a significant impact on the economy, reducing the economic benefits derived from activities and increasing the associated costs (Mouat, Lozano and Bateson 2010). However, it is hard to estimate the effect marine litter has on the economy, since some effects are easier to evaluate in economic terms than others. Moreover, costs are often not adequately recorded and therefore go unreported. McIlgorm, Campbell and Rule (2008) estimated the direct economic costs of marine debris in the Asia-Pacific Economic Cooperation Region using figures for 2008. They found that the main impacts were on the fishing industry (US$ 364 million), transportation and shipping (US$ 279 million) and tourism (US$ 622 million), resulting in a combined impact of over US$ 1.2 billion. The authors also highlighted the impact on the insurance industry, although this is harder to quantify, with damage to leisure craft included in the total for the tourism industry. A 2015 update to the study showed an increase in the total cost of damage in the region, with an estimated US$ 10.8 billion dollars in annual damage. These damages were valued at US$ 1.47 billion for fisheries and aquaculture, US$ 2.95 billion for shipping and marine transport and US$ 6.41 billion for marine tourism (McIlgorm et al. 2020).

Estimation of direct economic costs of marine debris in the Asia-Pacific Economic Cooperation Region using figures for 2008 found that the main impacts were on the fishing industry (US$ 364 million), transportation and shipping (US$ 279 million) and tourism (US$ 622 million), resulting in a combined impact of over US$ 1.2 billion.

Clean-up cost

A study on the cost of beach clean-ups in South Africa between 1992 and 1995 found that the Cape Town City Council spent approximately US$ 180,000 on beach clean-ups between 1992 and 1993, and it increased to US$ 200,000 for the period 1994–1995.

Tourism

Travel and tourism are highly impacted while essential for economic growth throughout Africa. In 2019, the sector accounted for 7.1 per cent of Africa's gross domestic product (GDP) (US$ 168 billion) and generated a quarter of all the new jobs created over the past five years

Fisheries

Marine litter increases the costs of fishing in three ways:

- Repairing damaged vessels and equipment, for example, repairing fouled propellers and replacing lost or damaged gear
- Loss of fishing time
- Reduced or contaminated catches

Clean-up costs

Beaches and harbours must be cleaned regularly to ensure they remain attractive and safe for their day-to-day uses and operations. The costs of cleaning up marine litter, both on beaches and in harbours with river inflows, increase significantly after storms, which wash large amounts of marine litter downstream into these environments (Ryan et al. 2009). The costs for municipalities of removing litter from beaches and public areas can be high (Secretariat of the Convention on Biological Diversity 2012; Beaumont et al. 2019). In addition to the cost of labour for physically carrying out removal, there are also the costs of the collection, transport, and disposal of litter.

A lack of reporting of these individual costs makes it difficult to quantify and to compare the costs attributed to marine litter (Mouat, Lozano and Bateson 2010). Nonetheless, the total cost of beach clean-ups in Denmark, Norway, Sweden and the United Kingdom (UK) in 2000 was estimated at US$ 4.42 million (Ten Brink et al. 2009). The removal of litter in other waterways is also expensive: the estimated cost of removing litter in South Africa from wastewater streams is around US $279 million per year (Ten Brink et al, 2009). Coastline clean-up costs for the municipality of Ventanillas in Peru are double the municipality's entire annual budget for public cleaning (UNEP 2016a).

Marine litter also impacts the shipping industry by creating additional hazards, particularly during periods of heavy rains. A good example of this is the Port of Durban in South Africa (Arabi and Nahman 2020). Not only do ports incur costs when large volumes of litter are washed into their environment, since they are tasked with ensuring the continuity of normal port operations, but they can also suffer from a loss of income due to the temporary closure of certain areas of the port. The costs of these clean-ups are often not quantified and therefore go unreported. It has been estimated that the removal of floating debris costs harbour authorities in the UK up to US$ 30,000 a year (Ten Brink et al, 2009). Similarly, the Port of Barcelona carries out daily clean-ups of floating litter, with over 117 tons collected in 2012 at a total cost of over US$ 300,000 (Werner et al. 2016).

A study on the cost of beach clean-ups in South Africa between 1992 and 1995 found that the Cape Town City Council spent approximately US$ 180,000 on beach clean-ups between 1992 and 1993 (Swanepoel 1995). For the period 1994–1995, the corresponding figure was US$ 200,000 (Ballance, Ryan and Turpie 2000). Another study of 63 coastal authorities in South Africa for the period 1994–1995 found that the Cape Town metropolitan area spends over US$ 232,000 a year on beach clean-ups, with costs varying based on the beach location. It also found that beaches on the west coast spent more than their counterparts on the east coast, due to the large amounts of kelp washing up on the shore. Extrapolating the costs for authorities that did not provide estimates, the total cost for the 63 authorities was estimated at over US$ 532,400 (Ryan and Swanepoel 1996).

There are also increased costs as a result of the upstream impacts of litter. As mentioned previously, litter clogging stormwater drains and sewers can damage property and infrastructure. Frequent flooding of the Msimbazi River floodplain in Dar es Salaam causes structural damages worth an estimated US$ $47.3 million a year, a figure that excludes the impacts on human health and businesses. The cost of managing flood damage in Ghana is estimated to be between US$ 2 million and 4 million for each major flood event in the past decade (Turpie et al. 2019).

Impacts on tourism

Marine litter has a negative effect on tourism, since tourists tend to avoid coastal cities whose beaches are polluted with litter, resulting in economic losses borne by coastal economies (Ballance, Ryan and Turpie 2000; Mouat, Lozano and Bateson 2010; Secretariat of the Convention on Biological Diversity 2012; UNEP and GRID-Arendal 2016). Participants in the subregional workshops identified this as a significant risk, particularly in regions that depend on tourism (GRID-Arendal 2020). Travel and tourism are essential for economic growth throughout Africa. In 2019, the sector accounted for 7.1 per cent of Africa's gross domestic product (GDP) (US$ 168 billion) and generated a quarter of all the new jobs created over the past five years (World Travel and Tourism Council 2019; United Nations Conference on Trade and Development [UNCTAD] 2017). In the Canary Current Large Marine Ecosystem, tourism accounts for approximately 900,000 jobs (300,000 in Morocco) and in sub-Saharan Africa, tourism has increased by 8 per cent in 15 years (Diop and Scheren 2016). The tourism industry is particularly vulnerable to pollution, especially in areas where coastal tourism is an important part of the sector and is simultaneously the source and victim of the pollution (Newman et al. 2015). Observations to this effect were shared during the workshops (GRID-Arendal 2020) by several participants from countries highly dependent on the tourism sector, such as Cabo Verde, Gambia and Liberia, where tourism makes up 45 per cent, 20.5 per cent and 15 per cent of GDP, respectively (Table 6).

According to 2016 figures for South Africa, the tourism industry directly contributes around US$ 8.5 billion to the country's GDP and employs 686,596 people (South Africa, Statistics South Africa 2018). In 2014, the direct contribution from marine ecotourism was approximately US$ 26.6 million, rising to approximately US$ 140 million when indirect contributions are taken into account (South Africa, Department of Tourism 2018). A study of beaches in the Cape Peninsula of South Africa in 1996 found that the primary factor behind the choice of a beach by visitors was its cleanliness: 50 per cent of residents and 40 per cent of foreign visitors were willing to spend more money to travel to a clean beach. Moreover, 60 per cent of domestic tourists said they would not return to Cape Town if they encountered more than 10 large items of litter per metre and 97 per cent of visitors said this would make them avoid the town's beaches, reducing the recreational value of the Cape Peninsula's beaches to US$ 20,000 per year and resulting in a loss of approximately US$ 530,000 for the region (Ballance, Ryan and Turpie 2000).

In Ghana, the importance of tourism means that the economic consequences of marine litter are highly significant. Approximately 3 million people live along the coast of Accra, where plastics are the most common type of litter. In 2004, the total income from tourism was estimated at US$ 650 million, approximately 5 per cent of the country's GDP. Tourist numbers in Ghana have increased from 145,000 in 1990 to 600,000 in 2004 (Tsagbey, Mensah and Nunoo 2009; Van Dyck, Nunoo and Lawson 2016). An example of the significant effect of litter on tourism from outside Africa is Geoje Island in South Korea, where heavy rainfall in 2011 washed up large amounts of debris onto the shore. This resulted in a 63 per cent drop in visitor numbers on beaches (890, 000 visitors in 2010 compared with 330, 000 visitors in 2011), with an equivalent loss of approximately US$ 29 million (Turpie et al. 2019).

Table 6. The contribution of tourism to the national economies of countries in the Abidjan Convention area

Country	GDP contribution (%, using 2011–2014 average)
Angola	4.0
Benin	6.0
Cabo Verde	43.4
Cameroon	6.6
Cote d'Ivoire	5.0
Democratic Rep. of the Congo	1.7
Gabon	2.4
Gambia	20.5
Ghana	7.7
Guinea	4.5
Guinea-Bissau	-
Liberia	-
Morocco	18.4
Namibia	14.7
Nigeria	4.0
Sao Tome and Principe	15.9
Senegal	11.4
Sierra Leone	5.6
South Africa	9.1
Togo	8.9

Source: UNCTAD 2017

Overall, while the subregional workshop participants believe international tourism contributes to marine litter, they do not regard these tourists as a major source of direct litter, partly due to the actions taken by the sector itself to ameliorate the issue (GRID-Arendal 2020). However, this implies that additional waste generated by international tourists contributes to overall waste volumes, increasing the potential for mismanaged waste. It was also noted that hotel staff and local authorities work to keep certain beaches as clean and attractive as possible to support tourism. The workshop participants believed the behaviour of national citizens made a much greater contribution to the problem of marine litter than international tourists.

The impact on fisheries and aquaculture

Over 12 million people in Africa are involved in the fishing industry. Many communities in Africa rely on subsistence fishing, which can be significantly impacted by marine litter (Jambeck et al. 2018; Sambyal 2018). In 2018, the African capture and aquaculture fisheries sector accounted for 7 per cent (12.50 million tons) of the global fisheries production and 25 per cent of the global inland capture (FAO 2020), representing 1.4 per cent of Africa's GDP (New Partnership for Africa's Development Planning and Coordinating Agency and African Union Interafrican Bureau for Animal Resources 2016). The industry employed 9 per cent (5.5 million workers) of the fishery-related workers on the planet, only second to Asia, and was home to 20 per cent of the global fishing fleet (FAO 2020). Production projections for 2030 predict that Africa's aquaculture sector will have the highest growth rate in the world (48 per cent compared with 2018) and the second highest growth rate in the fisheries and aquaculture sectors combined (12.7 per cent), behind Asia. The projected African consumption of fish is also expected to experience the second highest growth in the world, at 27 per cent by 2030, just behind Latin America (FAO 2020).

The fact that Africa is a net importer of fish in volume and a net exporter in value highlights the importance of the fishing sector for local food security and the challenges the continent is facing in keeping pace with the fast-growing population in the region. Additionally, it is expected that the projected climate change impact on marine capture fisheries will mostly affect tropical coastal regions of sub-Saharan Africa (FAO 2020). In this context, the potential impacts of marine litter on an important and already under pressure sector are particularly relevant to address.

Marine litter increases the costs of fishing in three ways:

- Repairing damaged vessels and equipment, for example, repairing fouled propellers and replacing lost or damaged gear
- Loss of fishing time
- Reduced or contaminated catches

(Mouat, Lozano and Bateson 2010; Secretariat of the Convention on Biological Diversity, 2012; GESAMP 2015; UNEP and GRID-Arendal 2016).

Fishers in Shetland estimated that 69 per cent of their catch was contaminated by marine litter and that additional costs were incurred through snagging of nets on debris, littering the sea floor. The costs of clearing nets and litter from propellers can be significant, especially when divers are required to carry out the work, and have been estimated to be between US$ 9,000 and US$ 45,000 per boat per year. The cost of marine litter to the UK fishing industry is estimated to be over US$ 31 million per year (Ten Brink et al. 2009). In Japan, based on insurance statistics, the cost to fishing vessels was estimated to be approximately US$ 40 million in 1985, equivalent to roughly 0.3 per cent of the country's total fishing revenue for that year. In the European Union, the total cost of marine litter to fishing fleets has been estimated at US$ 65.7 million, or 0.9 per cent of total revenue (UNEP 2016a). In Scotland, 86 per cent of Scottish fishing vessels have experienced reduced catches as a result of marine litter, costing an average of 11.7 to 13 million euros (US$ 15.5 to 17.2 based on 2010 exchange rate) year, equivalent to approximately 5 per cent of the total revenue of affected fisheries (Oosterhuis, Papyrakis and Boteler 2014).

In terms of aquaculture production, the costs of marine litter are related to damage to vessels and equipment, debris removal and staff downtime. For aquaculture operators, increased costs include the cleaning of blocked intake pipes and entangled propellers, as well as increased staff downtime (Mouat, Lozano and Bateson 2010).

ALDFG can entangle marine organisms, resulting in marine organism death, habitat degradation and lost revenue through the reduction of commercial fishing stocks (UNEP 2016a; GRID-Arendal 2016). This can have a significant impact on coastal cities that rely on the ocean for their income. In communities where shellfish gathering is common (usually carried out by women while men fish further offshore), marine litter can result in loss of income by reducing the quality of catches (Lynn, Rech and Samwel 2016). In 2002, the annual loss to the UK fishing industry from marine litter and ghost fishing was over US$ 31 million (UNDESA 2014). The annual loss of Antarctic toothfish due to losses from bottom longlines is estimated to be 208 tons (Webber and Parker 2012). In Chesapeake Bay in the US, a programme to remove derelict crab pots led to an estimated 27 per cent (13,504 tons) increase in the blue crab catch. If applied to all major crustaceans, the removal of 9 per cent of derelict pots and traps could increase global landings by almost 300,000 tons (Scheld, Bilkovic and Havens 2016; UNEP 2016a).

The impact on marine infrastructure

Additional costs that marine litter imposes on marine infrastructure include damage to vessels and emergency operations to rescue them, downtime, and litter removal and management, particularly affecting harbours and marinas. Entangled propellers and rudders in particular result in costly repairs for vessel operators and harbours and marinas incur the costs of removing litter to ensure an attractive and safe facility and environment for users (Mouat, Lozano and Bateson 2010; Secretariat of the Convention on Biological Diversity 2012). In April 2019, heavy rains washed large amounts of litter into the Port of Durban in South Africa. Major clean-up activities were carried out to remove the litter and debris, allowing the port to remain operational and continue providing safe facilities for its users. However, the large logs threatened the navigation of crafts in the harbour, preventing three vessels from being able to berth or sail during the period (Independent Online 2019). A study of the Port of Esbjerg in Denmark reported the annual costs of removing debris to be approximately US$ 87,000 (UNEP 2016a).

In 2008, 286 vessels with fouled propellers were rescued in the UK, at a total cost of between EUR 830,000 and 2,189,000 (Newman et al. 2015). In 2005, the US Coast Guard carried out 269 rescues linked to incidents involving marine litter. These incidents resulted in 15 deaths, 116 injuries and US$ 3 million in damage to property (UNDESA 2014).

There are also costs associated with the loss of cargo. The average cost of a container is between US$ 20,000 and US$ 24,500, although the value can be higher for certain types of cargo. Cargo loss can also result in insurance payments. For example, in the Monterey Bay National Marine Sanctuary in the US, 14 containers were lost from the merchant vessel Med Taipei in 2004, resulting in US$ 3.25 million in compensation, including the estimated environmental costs and legal fees (UNEP 2016a).

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Costs to other industries

Marine litter blown onto land can also impact the agricultural industry through costs of repairing damage to property and equipment, harm caused to livestock, increased vet bills and time lost due to cleaning up litter (Mouat, Lozano and Bateson 2010; Newman et al. 2015). There are no studies in the West, Central and Southern African Region showing the extent of these impacts on agriculture. However, negative effects of marine debris on agricultural lands have been reported in Shetland, where strong winds are frequent. It was estimated that each farmer loses around US$ 550 every year, with a total annual loss of US$ 860,000 for the island as a whole. The costs were attributed to time spent cleaning the land, clearing ditches, freeing entangled animals, increased vet bills and repairs to fences. Additional costs resulted from the loss of seaweed for fertilizer due to entanglement with plastic litter (Newman et al. 2015).

Marine plastic and microplastic litter are transboundary issues: the workshop participants from the west coast of Africa claim that despite implementing policies banning the production, sale and use of plastic bags in their countries, they can still be found on beaches or stuck in trees (GRID-Arendal 2020). Plastic bags may be transported by wind and water currents from areas without preventive measures into neighbouring countries where these measures are in place. The workshop participants also claimed that illegal markets have sprung up in countries with bans on plastic bags, introducing plastic bags into these countries. Livestock and cattle can eat plastic bags whose disposal is mismanaged, causing them to accumulate in the street (Braun and Traore 2015). This poses a health risk not only to the animals but also to the livelihoods of many families.

Marine litter can also cause damage to coastal power stations: macroplastic litter can block the screens of cooling water intakes of power stations near the coast, requiring the removal of litter from screens and incurring increased maintenance costs (Mouat, Lozano and Bateson 2010). It is hard to calculate the exact cost of this phenomenon due to the difficulty of distinguishing between costs related to marine litter and those related to natural debris such as seaweed, although its removal could cost around US$ 65,000, a figure that excludes pump maintenance costs (Mouat, Lozano and Bateson 2010). The full impacts remain unknown.

Control of invasive species

Marine litter provides a solid medium to which microorganisms and macrobiota can attach. Species that attach to marine litter can travel large distances and become invasive, colonizing and damaging marine environments and industries and affecting the economy of the region in question (Mouat, Lozano and Bateson 2010; Newman et al. 2015; UNEP and GRID-Arendal 2016). The main costs of combating invasive species are monitoring, control and eradication. Invasive species can also foul equipment and vessels, degrade ecosystem functions, cause the loss of amenities and impact human health (Mouat, Lozano and Bateson 2010; Secretariat of the Convention on Biological Diversity 2012).

6. Challenges and opportunities

Regional Seas Conventions and Action Plans play a crucial role in facilitating action at the national level. It is therefore important to identify the challenges faced by member states in preventing and managing marine litter and prioritize actions to overcome the barriers and improve the effectiveness of national and regional efforts.

The regional and national challenges identified by the workshop participants and experts (GRID-Arendal 2020) have been broadly categorized as:

- Waste management (for example, governance, collection capacity, infrastructure or technology)
- Political and legislative support
- Funding
- Knowledge management and capacity-building
- Awareness

These perceived challenges present opportunities for strengthening the governance of marine litter in the region and may also be considered in the development of a Regional Action Plan on Marine Litter. Where relevant, these may also be included in national action plans for member states. The main challenges and opportunities are summarized in Figure 15 and further described in the following sections.

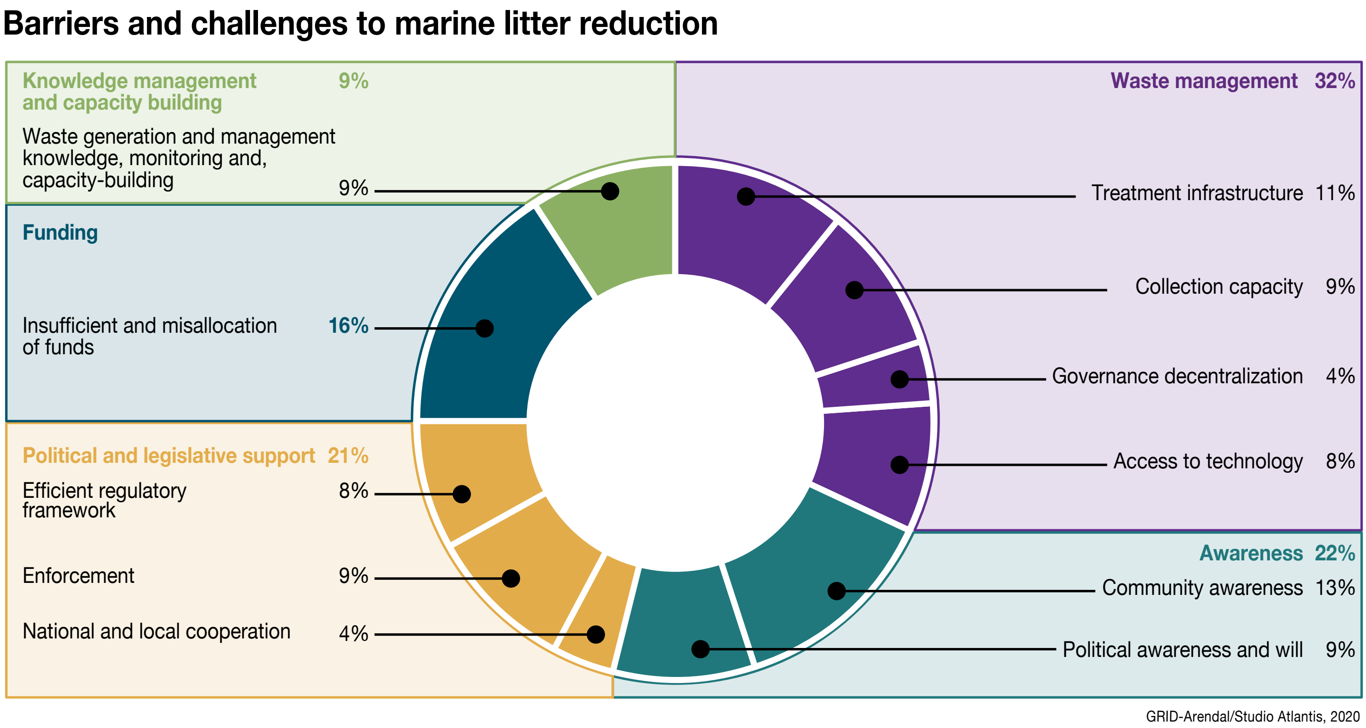
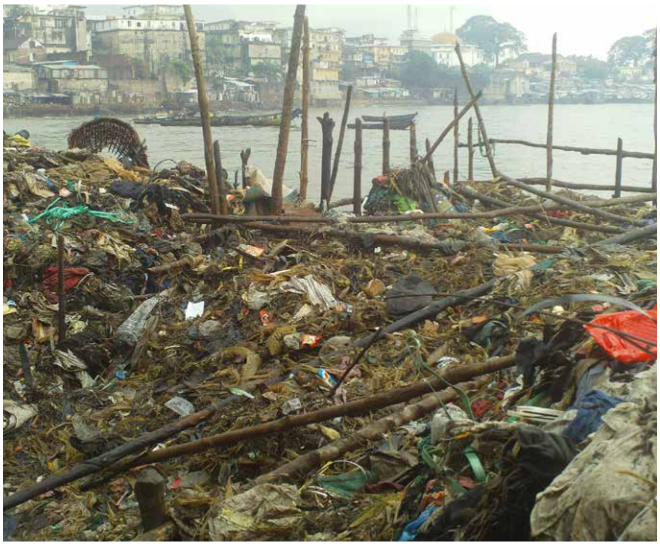


Figure 16. *Proportion of workshop participants identifying certain categories as barriers and challenges to marine litter*



6.1 Waste management

Many waste management systems in the West, Central and Southern Africa region are inadequate. Services may be absent in certain areas of countries or from the country as a whole. The latter was reported in Cabo Verde and Sierra Leone, leading to indiscriminate and widespread dumping of waste. There are also significant limitations and a lack of resources in terms of funding, equipment (including collection points, transfer centres, trucks, and bins), staff (for example, a lack of properly trained workers) and infrastructure (Ghana, Environmental Protection Agency 2016; GRID-Arendal 2020). Waste management systems are further weakened by importing and installing technology from abroad (including Europe) without adapting it to the local conditions or the necessary information or training to use it.

Opportunities for improvement of waste management	
Recycling and recovery	• More than 20 per cent of the workshop participants identified the recycling sector as an economic opportunity due to its potential to generate employment and promote alternative products and energy sources. • Targeting a circular economy presents opportunities to reduce waste and recover energy. However, this is often reliant on technology and funding.
Infrastructure	• Parallel infrastructure development for upstream engineering solutions, as well as waste management facilities and recycling, are both necessary conditions for waste management. • Technological requirements must be set out using clear terminology to ensure the accurate interpretation of infrastructure development recommendations.
Technology and alternative products	• Poor availability of alternative products and appropriate technologies reduces the effectiveness of measures to improve consumption and disposal behaviour, which have been identified as primary drivers of marine litter. • Several single-use plastics (for example, plastic bags and plastic octopus traps) have been identified as major sources of marine litter and could be addressed as a matter of urgency.
Political awareness	• Political will can be enhanced through greater knowledge of the impacts of poor management of waste and marine litter. Such knowledge can be supported by prioritization of relevant research. • Understanding of sources and pathways of marine litter can improve the process of policy decision-making as well as the quality of policies adopted.
Governance: decentralization	• Decentralization can facilitate improvements to infrastructure, human resource capacities, and allocation of funds. • When local actors are included and take ownership, this can lead to improved social behaviour and the enhancement of national funding source designs. • Employment opportunities, especially for rural and vulnerable communities, including the youth, can be improved by better governance of waste management.

6.2 Political and legislative support

A lack of political will and legislative support was raised in the workshops by many countries. The issue of marine litter and microplastics is not commonly seen as a priority for policymakers in West, Central and Southern African countries. Legislation prohibiting the dumping of waste near the coast and weak enforcement of laws and regulations is also common. Where plastic bags have been banned, illegal markets have sprung up, with bags imported from neighbouring countries where bans do not exist (GRID-Arendal 2020). Natural or longer-term products are more expensive than disposable plastic items, necessitating further investigation into affordable and accessible options for all citizens. Gaps also exist between legislative and administrative frameworks, with limited preventive measures promoted in legislation (GRID-Arendal 2020).

Similarly, the workshop participants consider stakeholder inclusion and coordination between authorities to be lacking. Implementation of actions is held back by the lack of communication and coordination between central and local government systems. In some countries in the Abidjan Convention area, governments do not consider stakeholder needs when designing policies and legislation.

Opportunities for improvement of political and legislative support	
Inter-ministerial cooperation	• A single national body should be established to coordinate activities across relevant ministries. • Workshops to increase awareness, build knowledge and apply best practices can strengthen coordination and provide additional funding sources.
Legal frameworks and enforcement	• Policy development should be informed by appropriate knowledge, including scientific community and stakeholder engagement. • Emphasis should be placed on preventive strategies, particularly activities that lead to a reduction in waste generation. • Enforcement can more efficient when combined with awareness-raising. • Obligations carried out within international agreements should be integrated into domestic legislative frameworks.
National collaboration	• Opportunities for non-governmental organizations (NGOs) and national organizations to engage in the design of interventions, as well as advocacy, will facilitate inclusive approaches that are more relevant to and accepted by society. This includes gender-inclusive, youth and informal sector engagement (UNEP 2018a). • Communication strategies at the local level could significantly improve the acceptance of and compliance with preventive measures. • Inclusion of stakeholders allows for direct feedback to ensure the long-term relevance of national and sub-national initiatives. • Increased institutional collaboration, including between government authorities, can lead to clearer and more cost-effective actions.
Local collaboration	• City-level engagement with local communities provides an opportunity for collaboration. • Local indigenous knowledge can provide valuable input to research activities. • Sharing of best practices would enable learning from the many examples of enhanced local collaboration and inclusion in the region.

6.3 Funding

Funding of waste management services is a challenge for the public sector in many West, Central and Southern African countries. Rural communities and informal settlements are often not serviced. The legal and policy frameworks provide little to incentivize investment by the public sector. A significant informal sector has therefore developed in the region, providing valuable collection and sorting services (UNEP 2018a). In addition, limited funding is available for research priorities and awareness-raising campaigns that could further improve the efficiency of waste management services.

Opportunities for improvement of funding	
Sustainable funding	• Funding allocation can be enhanced through appropriate legal support and inter-agency awareness-raising among government authorities. • Strategies that enhance the economic value of waste as a resource, thereby increasing opportunities for improved livelihoods, particularly for women and the informal sector, are more likely to be regarded favourably for allocation of funds. • Market-based instruments, taxes and environmental levies can provide funds for waste management services (OECD 2016a; Ocean Conservancy and Trash Free Seas Alliance 2019). • Legal and policy frameworks can improve the opportunities and incentives for investment by the private sector, while also integrating the informal sector (UNEP 2018a). • Funding grass-roots level initiatives allows for a gradual increase and upscaling over time.
Collaborative funding sources	• Recognition of the health impacts of diseases spread via waste can create avenues to enhance funding sources. • Health risks are posed by uncontrolled dumping, open burning, poor collection and health care waste, among others (UNEP 2018a). • Funding from bilateral collaborations with partner countries can provide seed funding and opportunities for knowledge and technology transfer.

6.4 Knowledge management and capacity-building

As is the case for most the African continent, the West, Central and Southern African Region has very limited data to support the design and monitoring of effective marine litter prevention strategies. This applies in particular to data on waste generation, management and final disposal (UNEP 2018a). Engagement in international fora can also enhance knowledge on solutions and best practices.

Opportunities for improvement of knowledge management and capacity-building	

Research and studies	• Increased efforts are urgently required to improve research outputs in the region. Key areas identified include:
	  • Waste characterization and flows (including the amount of plastic imported, sources of leakages, plastic composition and disposal methods used)
	  • Mapping of the recycling sector and opportunities
	  • Enhancing the economic value of plastic waste and capitalization thereof
	  • Environmental and social impacts of plastic and marine litter
	  • Alternative products and materials, including life cycle comparisons

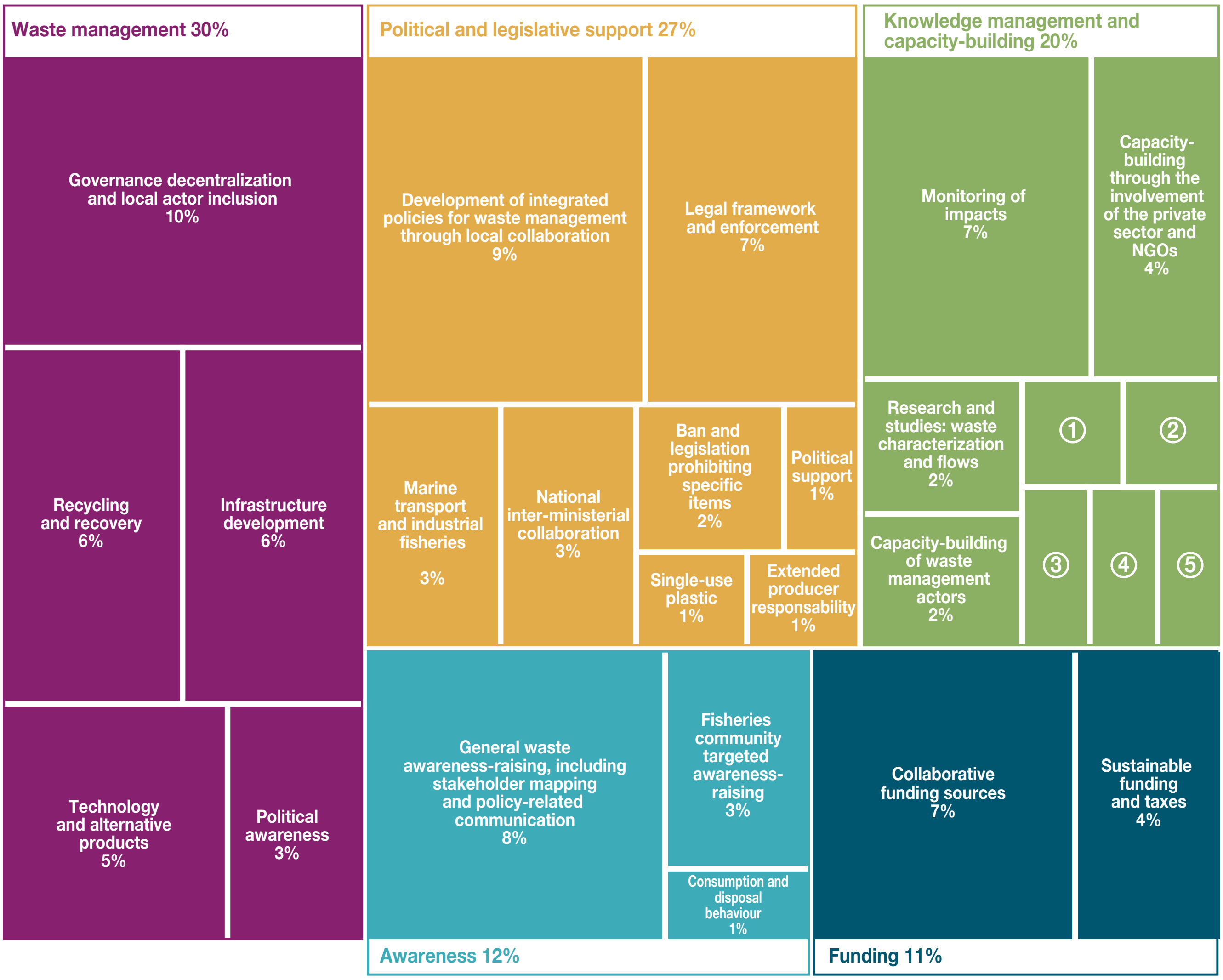
Monitoring of impacts	• The development of a regional marine litter and waste monitoring programme can facilitate and harmonize monitoring at the national level. • Local initiatives and structures can be created to monitor and replicate successful experiences from other countries in the Abidjan Convention area.
Indigenous knowledge	• The incorporation of indigenous knowledge presents opportunities for the inclusion of local actors and knowledge in decision-making. • Indigenous actors can also provide valuable contributions to the monitoring and review of effectiveness of policies and actions.
Capacity-building through international collaboration	• Attendance by local representatives and focal points at international and regional meetings can improve understanding of the issues and possible solutions. • Knowledge-sharing is a major opportunity for rapid, low-cost learning to support the design of measures, especially at the regional level, where challenges can be similar. • International support in the form of guidelines and sharing of best practices can promote and facilitate adoption of national measures. • Greater advocacy by NGOs and international organizations can stimulate action by the public and private sector.

6.5 Awareness

Awareness of the impacts of marine litter can greatly enhance the engagement of government authorities, civil society, and the private sector in initiatives for litter prevention and mitigation. A common theme among the workshop participants was the strong need for increased awareness in order to prioritize the issue and solutions. Awareness is particularly low in rural areas. Separation of household waste is extremely poor, expressed by some workshop participants as a result of the absence of a sense of belonging in shared and common spaces, translating to a lack of concern for the environment. Further awareness is required on the extent of pollution and waste, including for activities associated with offshore oil exploration and exploitation.

Opportunities for increasing awareness	
Stakeholder mapping	• Mapping and engagement of actors prior to implementation can enhance the relevance and targeting of awareness-raising actions. • Stakeholder mapping can identify actors to support awareness-raising activities.
Consumption and disposal behaviour	• There are significant opportunities in awareness-raising campaigns targeting consumption and disposal habits, since this could help to address some of the primary sources of marine litter. • Promoting a preference for alternative products can facilitate change. • Actors should aim to increase the acceptance of new – and sometimes mandatory – approaches.
Communities	• Over 40 per cent of the marine litter management workshop participants believed awareness-raising should largely target fisheries and coastal communities. • Broader community awareness of the impacts of poor waste management and marine litter was a priority for 50 per cent of the workshop participants (GRID-Arendal 2020).
Bioplastics	• Understanding of the composition and impacts of bioplastics is the main driver of their inappropriate disposal, requiring targeted education.
Policy communication	• Communication related to policies, together with awareness-raising on the issues being addressed, can significantly boost engagement and reduce the need for enforcement.

Solutions and opportunities



① Research and studies: economic value of plastic waste 1%
② Research and studies: recycling sector's mapping and opportunities 1%
③ Research and studies: alternative products 1%
④ Research andstudies: environmentaland social impacts 1%
⑤ Universities inclusion 1%

GRID-Arendal/Studio Atlantis, 2020

Figure 17. *Proportion of workshop participants identifying certain categories as solutions and opportunities for marine litter*

7. Recommendations

This section summarizes the recommendations provided by the participants of the marine litter management workshops in Ghana, Morocco and Namibia (GRID-Arendal 2020). Possible solutions to marine litter management are grouped into three broad categories: 1) creating supportive legal frameworks, 2) improving coordination and inclusion, and 3) raising awareness. These include improving existing protocols, legislation and policies in parallel with a reduction in the use of plastics in both industrial and domestic contexts, as well as ensuring that companies that produce or import plastic act in a socially responsible manner (GRID-Arendal 2020). These measures must be supported by greater awareness of the threat marine litter poses to freshwater and marine ecosystems. Before implementing measures or projects, it is essential to fill knowledge gaps in monitoring data collection by conducting environmental and social impact assessments for all projects to be developed in the coastal zone. It is also vital to establish effective waste management and monitoring systems, professionalize the waste management sector and identify and develop waste collection sites and controlled landfills.

Recommendations for marine litter reduction in the region	
Creating supportive legal frameworks	• Examine existing protocols, legislation and policies and identify areas for strengthening preventive measures, particularly integrated national waste management policies that acknowledge marine litter and microplastics. • Create a legislative environment that supports private sector investment, particularly by promoting resource efficiency and increasing the economic value of plastic waste (OECD 2019a; OECD 2019b). • Identify opportunities for development of context-sensitive extended producer responsibility schemes, waste collection fees, pay-as-you-throw systems, taxes, levies and other legislative measures to provide financial support to waste management services in order to increase rates of collection and recycling (Ocean Conservancy and Trash Free Seas Alliance 2019). • Consider context-sensitive prohibitions on unnecessary and avoidable single-use and other plastics. • Adopt national policies and initiatives that discourage fishers from discarding litter and encourage the reduction of losses of fishing gear at sea. Fishing-for-litter schemes have proved successful in other regions. Initiatives to date include providing jobs for women within fishing communities (UNEP 2018b). • Conduct socioeconomic studies to understand the benefits and impacts of various legal and policy interventions. • Establish a platform to share best practices and harmonize regional actions and policies, where appropriate.
Improving coordination and inclusion	• Consider the establishment of a national coordinating body to engage and monitor actions across relevant government agencies. Focal points for such bodies could engage at the regional level to facilitate knowledge-sharing and harmonization of activities, where appropriate. • Develop regional marine litter monitoring programmes to assist in the development of national programmes and reporting. • Prioritize social inclusion and job creation within the design and implementation of policy and legislative interventions, as well as awareness-raising and other actions taken at the national and local levels.
Raising awareness	• Identify areas where improved behaviour can contribute most to the prevention of marine litter in order to target campaigns and education programmes. • Investigate awareness-through-action programmes, such as fishing-for-litter and adopt-a-beach programmes, that use citizen science to collect data. • Create communications tools adapted to different contexts, languages, and social groups, for example, women and children, rural communities with no radio signals and a low level of formal education, those who are economically disadvantaged and other groups at risk of exclusion (GRID-Arendal 2020). • Include marine litter and microplastics material within school curriculums, church groups and other regular social gatherings.

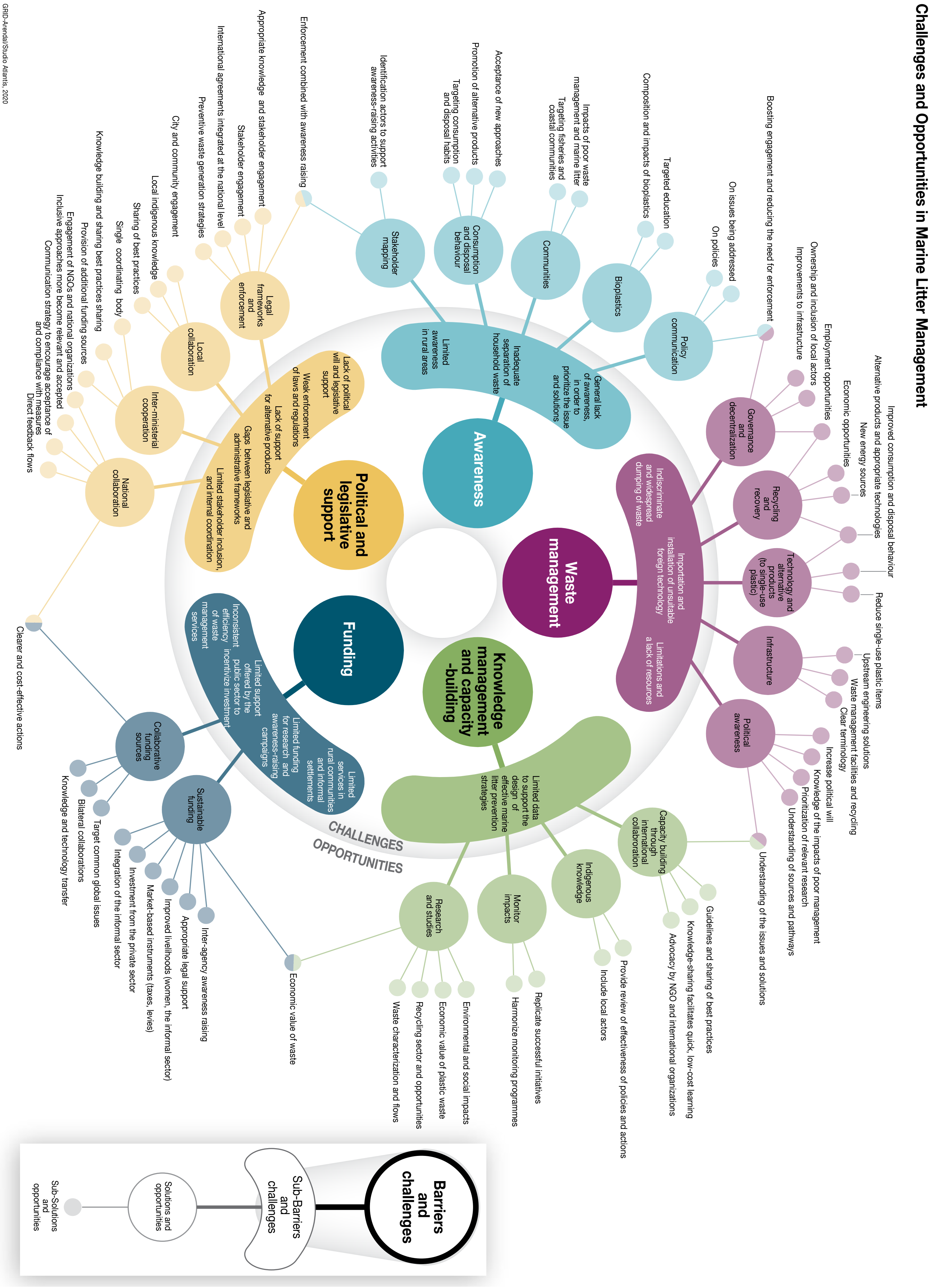


Figure 18. *Summary of challenges and opportunities identified by the workshop participants Source: GRID-Arendal 2020*

8. Conclusion

The amount of marine litter and microplastics has grown exponentially over the last two decades, becoming a major social, ecological, and economic problem in all countries along the west, central and southern coast of Africa (UNEP and GRID-Arendal 2016). If drastic measures and political action are not taken, the problem will continue to worsen, driven by the rapid population growth.

At the international level, there is a general lack of understanding of the extent of the impact of marine litter on ecosystem services, human health, society, and the economy. Research is mostly focused on the biological and ecological impacts of marine litter and there are major knowledge gaps in the West, Central and Southern African Region, especially in relation to the socioeconomic impacts. Most of the limited information that is available comes from South Africa and most of those studies focus on the Cape Town area, the impacts on tourism and the cost of beach clean-ups. There are few local, national, and regional scientific studies focused on the extent to which ecosystems and wildlife are negatively impacted by marine litter and microplastics, and it is therefore essential to commission or incentivize research in the region. However, this will require overcoming the challenges of gathering contextually relevant social and economic data, since authorities do not consistently report data. While this information may exist, it is neither systematically collected nor publicly available, since it is held at the national level by specific individuals in uncoordinated organizations.

A significant challenge in compiling this desk study was the poor availability of current literature and data for the region. The Abidjan Convention area has yet to make sufficient investment in expertise, not only in marine sciences but more specifically in the area of marine litter and microplastics. Such an investment would increase the volume of scientific knowledge and literature generated by the region and improve representation in international fora. While the desk study benefited considerably from the experts appointed to the three workshops by UNEP, FAO and IMO, expert opinion was otherwise lacking. Even among the appointed members, much of their input was based on perception rather than evidence and science.

Moreover, it is also essential to consider the language barrier. African countries are typically multilingual, and the West, Central and Southern African Region is no different. Our literature review concentrated on publications in English, although the workshop participants spoke English, French and Portuguese. Interpreting services were used to support the production of this desk study and facilitate communication and the sharing of experience among participants. However, it is equally important to acknowledge that interpreting services

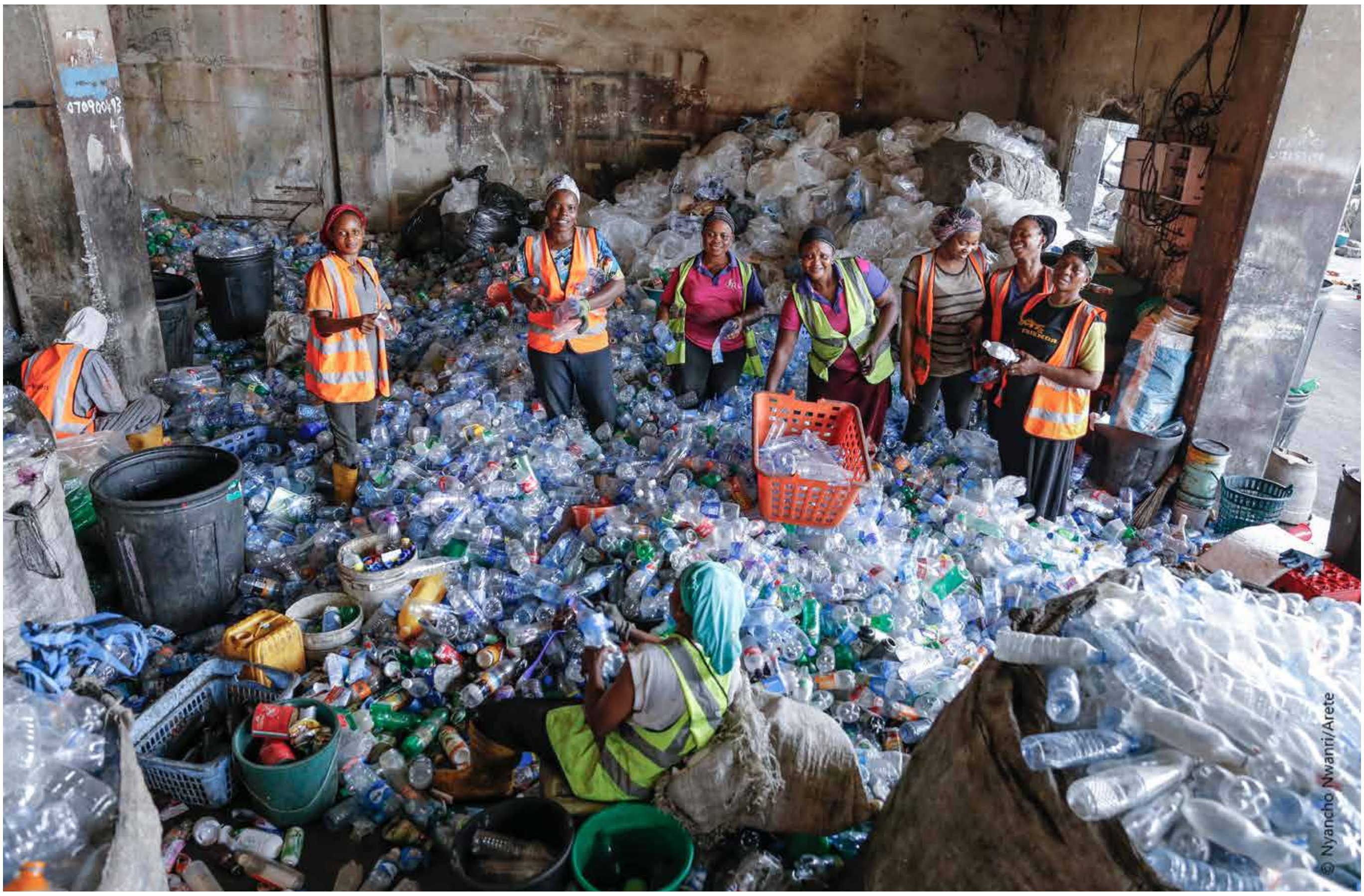
can affect the flow and accuracy of information and that the language barrier encouraged the literature review to prioritize international anglophone publications.

Nonetheless, despite data gaps in areas such as the amount of litter leaking into the environment from land- and sea-based sources, there is a consensus that marine litter originates from both sources, leading to a significant impact on the environment, human health, society and the economy.

All participants attending the Abidjan Convention workshop acknowledged the transboundary nature of marine litter, noting the potential of regional collective measures (for example, the standardization of specific policies, such as the ban on plastic bags), since countries with legislation on marine plastic litter continue to be affected by marine litter from neighbouring states.

Strong momentum is being built for improved national policymaking, with most Abidjan Convention member states playing an active role (annex III). Nonetheless, more needs to be done to incorporate the provisions of the Convention into national law. As such, this desk study will not only provide information on the needs of and context for member states regarding the Regional Action Plan on Marine Litter but will also assist countries to develop individual national marine litter action plans. Nigeria, which has a draft national action plan, is pioneering in this respect.

Marine litter and microplastics are closely linked to waste management. However, this factor has been overlooked in previous decades. Its complexity stems from the range of sources and pathways, which complicate measures to deal with it as a social, environmental, and economic problem. Increased research, funding, political will and awareness to stimulate changes in consumption and disposal behaviour are all required to bring about much-needed and lasting change. Many countries in the West, Central and Southern African coastal region are still in the early phases of understanding the impacts of marine litter and microplastics, as well as the potential solutions. The three workshops in Ghana, Morocco and Namibia for the development of an assessment for the prevention and management of marine litter in West, Central and Southern Africa allow data to be gathered to strengthen knowledge on the state of marine litter and microplastics, including pathways, hotspots and knowledge gaps. They also created a unique opportunity for experts from neighbouring countries to come together and served as a platform for learning and sharing best practices that can be replicated in similar contexts. Finally, the workshops provided an opportunity to raise awareness, sharing a range of opinions, allowing participants to take the first steps towards mapping stakeholders, initiatives, projects, and financing needs.



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10. Annexes

Annex I. Supporting text adopted in UNEA resolutions

The United Nations Environment Assembly (UNEA) has adopted several resolutions on marine litter and microplastics. Paragraph 1 of UNEA resolution 3/7 adopted in 2017 "stresses the importance of long-term elimination of discharge of litter and microplastics to the oceans and of avoiding detriment to marine ecosystems and the human activities dependent on them from marine litter and microplastics." This global goal of elimination was reinforced in UNEA resolution 4/6 adopted in 2019. The United Nations Environment Programme has also been requested to support countries in the development of marine litter action plans. The resolutions call for more collaboration and coordination, facilitated through the Global Partnership on Marine Litter. Examples include:

1/6 in 2014:

Requests the Executive Director, in consultation with other relevant institutions and stakeholders, to undertake a study on marine plastic debris and marine microplastics, building on existing work and considering the most up-to-date studies and data, focusing on:

(a) Identification of the key sources of marine plastic debris and microplastics;

(b) Identification of possible measures and best available techniques and environmental practices to prevent the accumulation and minimize the level of microplastics in the marine environment;

(c) Recommendations for the most urgent actions;

(d) Specification of areas especially in need of more research, including key impacts on the environment and on human health;

(e) Any other relevant priority areas identified in the assessment of the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection.

2/11 in 2016:

Recognizing the importance of cooperation between the United Nations Environment Programme and conventions and international instruments related to preventing and minimizing marine pollution from waste, including marine plastic litter, microplastics and associated chemicals and their adverse effects on human health and the environment, such as the International Convention for the Prevention of Pollution from Ships, the Basel Convention on the Control of Transboundary Movements of Hazardous Waste and Their Disposal and the Strategic Approach to International Chemicals Management…

[…]

[UNEA] welcomes the activities of the relevant United Nations bodies and organizations, including the Food and Agriculture Organization of the United Nations and the International Maritime Organization, which act in coordination with the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection and the Global Partnership on Marine Litter to prevent and reduce marine litter and microplastics; encourages the active contribution of all stakeholders to their work; and acknowledges the importance of cooperation and information sharing between the United Nations Environment Programme, the Food and Agriculture Organization and the International Maritime Organization, as well as the cooperation under the Global Partnership on Marine Litter, on this matter.

3/7 in 2017:

Noting also the commitment of member States to the "Our ocean, our future: call for action" declaration, adopted at the United Nations Conference to Support the Implementation of Sustainable Development Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development, in June 2017, and the voluntary commitments presented there, at the Our Ocean conferences held in Washington D.C., Valparaiso, Chile, and Valletta, Malta, and at the third session of the United Nations Environment Assembly, as well as the Group of 20 Action Plan on Marine Litter adopted in 2017, on efforts to prevent and reduce marine litter and microplastics.

4/6 in 2019:

Recognizing the work of the regional seas conventions and programmes for the protection of the marine and coastal environment and reiterating its invitation to regional and international organizations and conventions to increase their action to prevent and reduce marine litter, including plastic litter and microplastics, and the harmful effects thereof and, where appropriate, coordinate such action to achieve that end.

Annex II. Workshops on preventing and managing marine litter in West, Central and Southern Africa (GRID-Arendal 2020): Participants list

Accra, Ghana, 3–5 September 2019

Benin

Fabrice Metonwaho Yehonnou Tchegbenton
Head of The Marine Environment Protection Department, National Directorate of the Merchant Navy, Merchant Marine Directorate/Ministry of Infrastructure and Transport
Bernard I. Akitikpa
Head of the Artisanal Marine Fishing Division at the Fisheries Directorate, Ministry of Agriculture, Livestock and Fisheries
Faustine Coovi Sinzogan
Focal Point of Abidjan Convention, Ministry of the Environment and Sustainable Development

Cameroon

Dr Joseph Yepka
Chief of Service, Inland and Maritime Artisanal Fisheries, Ministry of Livestock, Fisheries and Animal Industries
Elvis Difang
Chief of Service, Marine Environmental Protection, Department of Maritime Affairs, Ministry of Transport

Cote d'Ivoire

Prof Ossey Bernard Yapo
Deputy Director, Ivorian Anti-Pollution Centre (CIAPOL)

Ghana

Godson Cudjoe Voado
Programme Manager, Environmental Protection Agency
Numbu Issahaque Sumabe
Maritime Administrative Officer, Ghana Maritime Authority
Eunice Ofoli-Anum
Senior Fisheries Officer, Fisheries Commission
Linda Ofei
Environmental Protection Agency
John Pwamang
Executive Director, Environmental Protection Agency

Guinea

Mohamed Lamine Sidibe
Director-General – Marine and Coastal Zones, Ministry of Environment, Water and Forests, Fatoumata
Saran Sylla
Deputy National Director of Maritime Fisheries at the Ministry of Fisheries, Aquaculture and Maritime Economy
Moudjitaba Sow
Pollution and Dangerous Goods Section Chief, Ministry of Transport

Guinea-Bissau

Octávio Cabral
Ministry of Environment
Robalo Hermenegildo
Ministry of Fisheries
Vladimir Joaquim Da Costa
Maritime Port Institute

Liberia

Daniel Tarr
Director of Marine Environmental Protection
Abayomi B.C. Grant
Senior Waste Management Officer, Environmental Research and Standards Unit, Environmental Protection Agency
Joyer Kume
Supervisor, Coastal Zone, National Fisheries and Aquaculture Authority

Nigeria

Joyce Iya Kitakang
Abidjan Convention Division, Federal Ministry of Environment
Hafsat Ochuwa Abdullah
Principal Fisheries Officer, Federal Ministry of Agriculture and Rural Development
Stephen Aishatu Atiyaye
Assistant Chief Marine Environment Management Officer, Nigerian Maritime Administration and Safety Agency (NIMASA)

Sierra Leone

Sheku Mark Kanneh
Environmental Protection Agency
Abdul Aziz Kamara
Inland Waterways Officer, Sierra Leone Maritime Administration

Togo

Aziaba Ayikoé Galév
Agricultural Works Engineer, Ministry of Agriculture, Animal Production and Fisheries
Akousso Ayitou
Maritime Affairs Administrator, Ministry of Infrastructure and Transport
Leliwa Tchèzoutèma
Marine Engineer, Directorate of Maritime Affairs, Ministry of Infrastructure and Transport

Windhoek, Namibia, 17–19 September 2019

Congo, Republic of

Dave Mboumba
Continental Desktop Chief, Directorate-General of Environment and Water, Ministry of Environment

Namibia

Flavianus Ashipala
Senior Ship Surveyor, Ministry of Works and Transport (Directorate of Maritime Affairs)
Vilho Kambonde
Marine Superintendent, Ministry of Fisheries and Marine Resources

Sao Tome and Principe, Democratic Republic of

Fernando Trindade
Engineer Head of Division, Ministry of Environment
Aleris Frank Do Nascimento Mendes
General Director, Maritime and Port Institute

South Africa

Sumaiya Arabi
Environmental Research Scientist, Council of Scientific and Industrial Research (CSIR), Durban
Motebang Nakin
Ministry of Environmental Affairs
Zaynab Sadan
Circular Plastics Economy Research Officer, Policy and Futures Unit, World Wildlife Fund (WWF) South Africa

Rabat, Morocco, 25–27 September 2019

Cabo Verde

Malik Duarte Lopes
Director-General for the Maritime Economy, Ministry of Maritime Economy

Gambia

Olimatou Danso
Gambia Maritime Administration

Mauritania

Camara Dramane
Technical Adviser on the Marine Environment and Coastal Areas, Ministry of Environment and Sustainable Development
Souleymane Boubacar Dramane
Officer, Ministry of Fisheries and Maritime Economy
Traoré Mohamedou
Deputy Director of the Merchant Navy, Ministry of Fisheries and Maritime Economy

Morocco

Fatima Hakimi
Merchant Navy Directorate
Amanou Siman
Maritime Fisheries Department
Labbi Bennaouar
Ministry of Maritime Fisheries
Khadija Rhayour
State Secretariat in charge of Sustainable Development
Sami El Iklil
The Mohammed VI Foundation for Environmental Protection
Loubna Salhi
Merchant Navy Directorate
Amal Mellack
State Secretariat in charge of Sustainable Development
Baissan Emenouar
State Secretariat in charge of Sustainable Development

Annex III. Abidjan Convention background, partnerships, and developed projects

The Convention for Cooperation in the Protection, Management and Development of the Marine and Coastal Environment of the Atlantic Coast of the West, Central and Southern Africa Region (Abidjan Convention), which came into force in 1984, includes four articles on marine litter. Articles 5 to 9 of the Convention address pollution issues in the area covered by the Convention, ranging from air pollution to seabed pollution. The Additional Protocol to the Abidjan Convention Concerning Cooperation in the Protection and Development of Marine and Coastal Environment from Land-Based Sources and Activities in the West, Central and Southern African Region (LBSA Protocol),[5] adopted in 2012, aims to prevent, mitigate and control pollution caused by land-based activities. Similarly, the Protocol on Integrated Coastal Zone Management, adopted in 2019, seeks to facilitate better planning and coordinated development of the coastal zone, including insular belts and river basins, and maintain the integrity of insular belts, coastlines and river basins.

The Abidjan Convention also launched the African Marine Waste Network, in partnership with the Sustainable Seas Trust in July 2016. The network provides an active platform for collaboration, resources, and knowledge-sharing in African countries and across borders to find solutions to the problem of marine litter in Africa. Several multilateral environmental agreements cover the region, including an agreement to support the development of action plans to combat marine litter and microplastics, and support the recycling efforts of parties to the Abidjan Convention, in partnership with private actors.

At the Abidjan Convention Conference of the Parties (COP) 12 in 2017, the Secretariat, countries and partners were invited to carry out a joint assessment of the current state of waste generation in Africa, in collaboration with the African Marine Waste Network and other relevant institutions. The aim was to develop a programme to raise awareness of the harmful effects of marine waste and the importance of tackling the problem among relevant agencies and organizations in the region (United Nations Environment Programme [UNEP] 2019). The World Wildlife Fund (WWF) has produced a similar study for the African region, launched in October 2019 in Johannesburg. The Abidjan Convention is currently in discussions with WWF regarding conducting activities related to plastic pollution in the region, including funding for the global strategy.

While reports based on the available grey literature provided a foundation for current developments on plastics in the region, these would benefit from being supplemented by in-depth field studies to improve understanding of the phenomenon with scientific data. As part of the framework of the Multilateral Environmental Agreements in African, Caribbean and Pacific Countries – Phase III project, funded by the European Union (EU) and UNEP, the Abidjan Convention is working with partners, including the African Marine Waste Network, WWF and the Secretariat of the Basel, Rotterdam and Stockholm Conventions, to scientifically characterize the phenomenon of plastic pollution and develop a regional action plan and national plans to mitigate plastic pollution in the region. The process aims to involve all stakeholders (municipalities in charge of waste management, the private sector, civil society, researchers, and the State).[6] Discussions have already been held with the Tara Ocean Foundation to characterize the plastic pollution from some rivers in the region.

The Abidjan Convention promotes scientific and technological collaboration, including the exchange of information and expertise, to help identify and manage environmental issues. Historically (particularly from 1985 to 1999), the Abidjan Convention has faced difficulties that have slowed its progress. The Convention has just undergone a revitalization process, which has strengthened cooperation instruments between member countries, including:

- The adoption of a regional contingency plan and other means to prevent and combat pollution incidents (2011)
- The ratification of the LBSA Protocol (2012)
- The establishment of the Ad Hoc Committee on Science and Technology (CST; 2014)
- The establishment of the Regional Emergency Coordination Centre for Marine Pollution
- The signing of three additional protocols to the Abidjan Convention:
  - Protocol on the Sustainable Mangrove Management
  - Protocol on Integrated Coastal Zone Management
  - Protocol on Environmental Norms and Standards for Offshore Oil and Gas Exploration and Exploitation Activities.

Over the years, the Abidjan Convention has sought to strengthen South–South cooperation through various programmes. Under Decision CP 11/12. Development of South–South cooperation, the Abidjan Convention is cooperating with the countries of the Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention), adopted in 1976, on the development of indicators for monitoring the implementation of the Abidjan Convention. The Abidjan Convention is also working with Caribbean countries in the fight against sargassum seaweed. In the framework of the Multilateral Environmental Agreements project, the Abidjan Convention has established a partnership with the countries of the Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (Cartagena Convention), adopted in 1983, in areas such as loss of biodiversity, plastic pollution and ocean governance. The variety of partnerships helps the Abidjan Convention Secretariat to fulfil its mandate and achieve its programme objectives, particularly regarding regional cooperation. A range of partners have supported the Secretariat by providing funds directly for the implementation of activities (see the numbered list that follows below).

5. The protocol was adopted in Grand Bassam (Cote d'Ivoire) on 22 June 2012 and is also known as the Grand Bassam Protocol.

6. A meeting on the subject was scheduled to be held in April in Accra but was postponed indefinitely due to the COVID-19 pandemic.

The Abidjan Convention is recognized as a major actor and a privileged partner in the management of marine and coastal biodiversity throughout the Atlantic coast of the African continent. In addition to the activities already implemented and partnerships established, others are in the process of being finalized. The variety of partnerships helps the Abidjan Convention Secretariat to fulfil its mandate and achieve its programme objectives. A range of partners have supported the Secretariat by providing funds directly to support the implementation of activities.

1. West Africa Biodiversity and Climate Change programme

The West Africa Biodiversity and Climate Change programme is a five-year programme funded by the United States Agency for International Development (USAID) to improve conservation and climate-resilient, low-emissions growth in West Africa. Working with key regional partners, the Economic Community of West African States (ECOWAS), the Mano River Union and the Abidjan Convention, the programme targets national and subnational institutions, building capacity at all levels, with a particular focus on combating wildlife trafficking, building coastal resilience to climate change and reducing deforestation, forest degradation and biodiversity loss.
Recognizing the pivotal role of the Abidjan Convention in the region, the programme conducted the Integrated Technical and Organizational Capacity Assessment in October 2015, leading to an institutional strengthening plan whose main points were:

- Designing a communications strategy
- Recruiting a communications specialist to support the implementation of the strategy
- Recruiting a consultant to develop a monitoring and evaluation plan for projects in the Convention portfolio
- Evaluating support for the implementation of a data management system.

The next steps in the plan are an organizational network analysis and recruitment of a consultant to develop a resource mobilization strategy. The evaluation aims to ensure an effective internal system for measuring the progress and performance of all Abidjan Convention project activities.

2. STRONG High Seas

Funded by the German Federal Ministry of the Environment, Nature Conservation and Nuclear Safety, the STRONG High Seas project facilitates the development and implementation of comprehensive cross-sectoral approaches to the conservation and sustainable use of biodiversity in marine areas beyond national jurisdiction in the South-East Atlantic and South-East Pacific. It builds on the interest of both regions and global political momentum to identify best practices, and provide regional institutions and national authorities with the knowledge, tools and capacity to support both the implementation of existing approaches to regional ocean governance and the development of new ones.

The project will promote technical and scientific cooperation and propose regional initiatives. Experiences will be shared with other regions and stakeholders to facilitate mutual learning and identify best practices. The project will also develop regional governance options in a future international instrument under the United Nations Convention on the Law of the Sea (UNCLOS) and share lessons learned at the global level to support ocean governance at appropriate scales.

3. Mami Wata

Funded by the German Federal Ministry of the Environment, Nature Conservation and Nuclear Safety through its International Climate Initiative, the Mami Wata project, which aims to strengthen marine management in West, Central and Southern Africa through training and implementation, works with African countries to build capacity in integrated ocean management. The project recognizes the importance of healthy marine and coastal ecosystems for human well-being and development, and uses tools and strategies to improve their conservation, sustainability, and biodiversity in countries along the Atlantic coast of Africa.

The project covers the Abidjan Convention area,[7] a combined exclusive economic zone of about 4.8 million km^2, and is implemented by GRID-Arendal and the Abidjan Convention Secretariat. It aims to strengthen national and regional action to enhance the value of marine and coastal ecosystems, through a dual approach:

- Capacity-building of stakeholders through training on State of the Marine Environment assessments and the description of ecologically or biologically significant marine areas from the Convention on Biological Diversity
- Marine spatial planning.

The project supports technical capacity-building in Abidjan Convention member states for integrated ocean management. A key aspect of this capacity-building is developing a set of tools to support the three aspects of integrated ocean management (the State of the Marine Environment Report, the identification of ecologically or biologically significant marine areas and marine spatial planning). Marine spatial planning is a relatively new method of managing human activities on the high seas, and is a long-term strategic process that guides stakeholders in the use of marine space, including where, when and how it is used.

4. ResilienSEA

Funded by the MAVA Foundation, the ResilienSEA project focuses on seagrass beds, which are one of the ocean's most important habitats. Seagrass beds, which serve as nurseries and feeding areas, protect our coasts and store carbon, are relatively unknown among the public and are in urgent

7. The pilot phase involves three countries: Benin, Cote d'Ivoire and Ghana.

need of protection. One of the main reasons for the threat they face is the lack of information on some of the most fundamental aspects of their distribution and health. This project will aim to strengthen knowledge on seagrass beds in West Africa, conducting pilot programmes at selected sites to implement management tools and improve the status of their protection and the services they provide. The project is being implemented by GRID-Arendal and the Abidjan Convention in Cabo Verde, Gambia, Guinea, Guinea-Bissau, Mauritania, Senegal and Sierra Leone.

5. MAVA Foundation projects

In addition to ResilienSEA, the MAVA Foundation is also financing several projects with the Abidjan Convention. These included financial support for the Additional Protocol to the Abidjan Convention on Norms and Standards for Offshore Oil and Gas Exploration Activities. The project aimed to develop a regional instrument on the exploration and exploitation of offshore oil and gas reserves, including:

- Establishing a regulatory oversight framework for offshore oil and gas activities
- Anticipating difficulties in the implementation of the offshore protocol
- Strengthening the technical knowledge of stakeholders.

The foundation has also funded a new project on the development of response plans for pollution from offshore activities as part of the Environmental Management of Offshore Oil and Gas Activities project.

Finally, it is financing the Pathways to Resilience in Semi-arid Economies (PRISE) project, which aims to reduce the impacts of coastal infrastructure in West Africa.

6. West Africa Coastal Fisheries Initiative

The West Africa Coastal Fisheries Initiative, which is a collaboration between the Food and Agriculture Organization of the United Nations (FAO) and UNEP, is being implemented in Cabo Verde, Cote d'Ivoire and Senegal. It aims to strengthen fisheries governance, management and value chains through the implementation of an ecosystem approach to fisheries, relevant international instruments and innovative governance partnerships.

UNEP has entrusted the Secretariat of the Abidjan Convention with the implementation of result 1.2.2. of Component 1, which deals with fisheries governance and management. The Secretariat applies a participatory approach involving the various actors (the State, civil society, the private sector and researchers) at the national and local levels to ensure the sustainable conservation and rational use of mangrove resources, as set out in the Additional Protocol to the Abidjan Convention on Sustainable Mangrove Management and its implementation action plan. The Secretariat is expected to conserve 700 ha of mangroves in Cote d'Ivoire and Senegal over the next three years.

7. Guinea Current Large Marine Ecosystem Strategic Action Programme

Funded by the Global Environment Facility, the Guinea Current Large Marine Ecosystem Strategic Action Programme aims to strengthen regional governance and ecosystem-based management by supporting capacity-building in countries for the implementation of the measures of the strategic action programme on transboundary fisheries, biodiversity conservation and pollution reduction.

This will be achieved through activities and outputs under four components: (i) regional governance strengthening and regional and national capacity-building; (ii) fisheries governance and management strengthening; (iii) assessment and consultation of stakeholders, including relevant government departments; (iv) analysis of pollution hotspots in programme countries and mobilization of the private sector.

The overall environmental benefits expected include the protection of habitats and fish stocks of global importance in the Guinea Current Large Marine Ecosystem. The project will contribute to improved governance and resource management and build the capacity of stakeholders to take into account the value of sustainable fisheries. Sustainability will also be enhanced by improved resource management and poverty reduction in the 16 participating countries.

8. West Africa Coastal Areas Resilience Investment Project

Funded by the World Bank, the West Africa Coastal Areas programme provides expertise and funding to the countries in the region for the sustainable management of their coastal areas to protect against the risks created by erosion, flooding and pollution. It also strengthens the regional integration of countries by working with related regional institutions and in the context of regional agreements to make the communities and economic assets of the coastal areas of West African countries more resilient.

The programme is present in six countries (Benin, Cote d'Ivoire, the Democratic Republic of Sao Tome and Principe, Mauritania, Senegal and Togo) as part of the regional Resilience Investment Project, with a total budget of US$ 221 million, and US$ 190 million of credits and grants provided by the World Bank. The project consists of a combination of policy and institutional activities to respond to the demands for physical and social investment at both regional and national levels.

It comprises four components, the first of which will be implemented by the West African Economic and Monetary Union, the International Union for Conservation of Nature (through its Central and West Africa Programme), the Ecological Monitoring Centre and the Abidjan Convention Secretariat. The Secretariat is responsible for assisting the six participating countries in technical matters related to ratifying and implementing regional and international coastal and marine protocols (subcomponent 1.2).

9. UN-Habitat Resilient Coastal Communities

This project, which is supported by the Adaptation Fund, strengthens the resilience of coastal settlements and communities in Cote d'Ivoire and Ghana (and, in a later phase, in West Africa) to climate change, while respecting the government's national priorities in implementing interventions.

The subobjectives of the project are consistent with the project components and outcomes of the Adaptation Fund. They are:

- Technical and institutional capacity-building of local and national governments to increase coastal resilience through coastal management and urban planning
- Community capacity-building to anticipate and respond to coastal risks related to climate change
- Increasing the resilience of coastal ecosystems and the built environment in the target areas, taking into account international, national and local needs and impacts
- Increasing the resilience of coastal ecosystems and the built environment at the community level by promoting the generation of income
- Supporting systematic international and national transformation towards improved coastal management, urban planning and specific examples of intervention through knowledge management and the establishment of institutional and regulatory frameworks.

The project has five components: (i) coastal zone management and land-use strategies at the district level; (ii) resilience planning at the community level; (iii) transformative coastal resilience-building interventions at the interdistrict level, taking into account international, national and local needs and impacts; (iv) specific interventions at the community level, taking into account local needs and impacts/livelihood opportunities; (v) knowledge management, communication and institutional and regulatory frameworks at the regional, national and local level.

The five components respond to the problems and needs identified by local and national governments. Achieving the project's main objective of increasing the resilience of coastal institutions and communities in Cote d'Ivoire, Ghana and ultimately West Africa to climate change means developing a sustainable vertical and horizontal learning environment and institutional framework to enable approaches and interventions that respond to local needs but can also be replicated and scaled up elsewhere. The role of the national government is key to ensuring the replicability of resilience interventions.

The full proposal and lessons learned will benefit not only the most vulnerable communities but also national, district and community governments to support Cote d'Ivoire and Ghana and their neighbours.

10. African, Caribbean and Pacific Multilateral Environmental Agreements project

Funded by the EU and in partnership with FAO, the overall objective of this project is to strengthen and improve the capacity of African, Caribbean and Pacific countries to effectively implement the selected multilateral environmental agreements, in order to increase the environmental sustainability of the agricultural sector. The project combats the depletion and degradation of natural resources (water, soil and biodiversity) by creating synergies and collaboration between environmental and agricultural areas, moving from global governance to policy and implementation on the ground.

Its specific objective is to integrate biodiversity into all sectors in the three African, Caribbean and Pacific regions to support sustainable agriculture and the conservation of natural resources, paying particular attention to specific regional priorities. These include land degradation and desertification, as well as the related problems of food security and migration, which are exacerbated by damage caused by land clearance, invasive alien species, over-exploitation of agrochemicals and other poor agricultural management practices.

The project will focus on the implementation of the Convention on Biological Diversity, the Basel, Rotterdam and Stockholm Conventions, and the United Nations Convention to Combat Desertification, with an emphasis on sustainable land management issues, to halt land degradation.

As part of the planned activities for this project, the Abidjan Convention will:

- Strengthen regional cooperation on ocean governance
- Develop a regional action plan and national action plans against plastic pollution
- Help reduce biodiversity loss by expanding the Marine Protected Areas network, developing a new protocol and strengthening protection of endangered species.

West Africa's contribution to Africa´s GDP growth has increased over the last few years – from below 7 percent in 2016 to more than 28 percent in the last two years. This growth, compounded by various drivers of marine litter production, leads to predictions of a steady increase in the volume of litter entering the ocean from land in the West, Central and Southern African coastal region.

To efficiently respond to marine litter management challenges, both land- and sea-based sources must be addressed. Most human activities that contribute to marine litter are related to the production, manufacturing, transport, trade, consumption and inappropriate disposal of goods. Governance has a key role to play in this area. A number of agreements have been adopted at the international and regional levels with direct or indirect measures to prevent marine litter, yet large knowledge gaps remain in translating these measures into regional and national action plans.