Maritime Domain Awareness in SADC

(Map drawn by Mafwila, 2022)

STUDY REPORT

SADC MDA REPORT

CONSULTANCY CONTRACT TO DEVELOP THE MARITIME DOMAIN AWARENESS (MDA) STUDY IN THE SADC REGION

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List of acronyms and abbreviations

2050 AIMS	2050 Africa's Integrated Maritime Strategy
AIS	Automatic Identification System
AMD	African Maritime Domain
ARMSCOR	Armaments Corporation of South Africa
AU	African Union
BCC	Benguela Current Convention
BE	Blue Economy
BMA	Border Management Authority
DCoC	Djibouti Code of Conduct
DCoC(J)	Djibouti Code of Conduct, Jeddah Amendment
DRC	Democratic Republic of Congo
EEZ	Exclusive Economic Zone
GDP	Gross Domestic Product
IMO	International Maritime Organization
ICZM	Integrated Coastal Zone Management
IMSS	Integrated Maritime Security Strategy
ISPS	International Ship and Port Facility Security
ISDSC	Inter-State Defence and Security Committee
IOR-ARC	Indian Ocean Rim Association for Regional Cooperation
MCS	Monitoring Control and Surveillance
MDA	Maritime Domain Awareness
MDAC	Maritime Domain Awareness Centre
MMCC	Multinational Maritime Coordination Centre
MSA	Maritime Situational Awareness
MRCC	Maritime Rescue Coordination Centre
MSP	Marine Spatial Planning
NATO	North Atlantic Treaty Organisation
NMICC	National Maritime Information and Coordination Centre
RMIFC	Regional Maritime Information Fusion Centre
RAMTC	Revised African Maritime Transport Charter
ReCAAP	Regional Cooperation Agreement on Combating Piracy and Armed Robbery against Ships in Asia
REC	Regional Economic Community
SADC	Southern African Development Community
SDG	Sustainable Development Goals
UAV	Unmanned Aerial Vehicle

Executive Summary

Established in 1992, Southern African Development Community (SADC) is committed to Regional Integration and poverty eradication within Southern Africa through economic development and ensuring peace and security. The Regional Economic Community comprises of 16 Member States, namely, Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, United Republic of Tanzania, Zambia and Zimbabwe.

SADC has recognized the importance of the blue economy as a key driver of economic growth and development in the region. The blue economy is a concept that promotes the sustainable use of ocean resources for economic growth, improved livelihoods, and job creation while preserving the health of the marine environment. To maximise the sustainable use of the ocean, SADC has developed the sustainable Blue Economy strategy to unlock the potential of uses of the ocean resources, protecting and conserving the marine ecosystems. However, implementing the Blue Economy requires a "toolbox" with a number of existing, new, and often better strategies. These include integrated maritime strategies and policies, maritime domain awareness, integrated coastal management, marine protected areas.

One of the highly rated and promoted tools is known as Maritime Domain Awareness (MDA). It has been argued that the Blue Economy makes its strongest gains when leveraging existing institutional relationships to address strategic gaps that affect multiple sectors and players, and which catalyze visible benefits for them in the long term. Ecosystem-based management, maritime domain awareness, marine spatial planning (MSP), integrated coastal zone management (ICZM) and the establishment of marine protected areas (MPAs) are established elements in support of the Blue Economy.

Maritime Domain Awareness (MDA) is a critical concept in the domain of maritime security, which refers to the capability to identify, track, and monitor the activities of vessels operating in a given maritime domain. The primary objective of MDA is to enhance situational awareness and facilitate timely decision-making to prevent illegal activities, including smuggling, piracy, and terrorism, human trafficking, in the maritime environment.

To achieve MDA, a comprehensive approach involving different stakeholders, including government agencies, law enforcement bodies, and commercial organizations, is required. The approach encompasses various technological solutions, such as satellite surveillance systems, automatic identification systems (AIS), and vessel monitoring systems (VMS), among others.

The implementation of MDA initiatives requires close cooperation and collaboration among different actors at the national, regional, and international levels. Governments, in particular, play a crucial role in establishing legal frameworks, policies, and strategies to enhance MDA capabilities and improve maritime security. It also includes sharing information and intelligence and building capacity in areas such as data collection, analysis, and information-sharing. It also requires investment in technology and infrastructure to support MDA activities. Furthermore, In the context of the sustainable SADC blue economy, MDA remains a critical tool for promoting sustainable fisheries management, combating

illegal, unreported, and unregulated fishing, and reducing marine pollution. MDA can also support the development of maritime transport and logistics infrastructure and the identification of opportunities for blue economy investments.

MDA is a critical tool for the implementation of the SADC Sustainable Blue Economy. It can contribute to the economic growth and development of the region while ensuring the sustainability of the marine environment. By promoting transparency and traceability in the maritime domain, MDA can also help prevent and combat illegal activities such as piracy, illegal fishing, and drug trafficking

Chapter 1: Introduction to the study

1.1 Background

The Southern African Development Community (SADC) is a Regional Economic Community comprising 16 Member States, namely, Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, United Republic of Tanzania, Zambia and Zimbabwe. Established in 1992, SADC is committed to Regional Integration and poverty eradication within Southern Africa through economic development and ensuring peace and security.

The vision of and ultimate impact desired by the Southern African Development Community (SADC) is one of a common future, a future in a regional community that will, among other objectives, ensure social-economic wellbeing and improve the standards of living and quality of life, freedom and social justice and peace and security for the peoples of Southern Africa. By 2050, we envision a peaceful, inclusive, middle to high income industrialised region, where all citizens enjoy sustainable economic well-being, justice and freedom. To attain this vision, SADC's expected specific results include the promotion of sustainable and equitable economic growth and socio-economic development that will ensure poverty alleviation with the ultimate objective of its eradication through regional integration.

With a population of 345.2 million people (2018), and growing at a rate of 2.5% per annum, the SADC region is increasingly developing into a huge market for the African region and beyond. The largest share of the population in the SADC lives in the Democratic Republic of Congo (DRC) with 26.6%, followed by South Africa with 16.7%, and the United Republic of Tanzania with15.7%. The Gross Domestic Production (GDP) for the SADC region stood at $721.3 billion in 2018 and growing at 1.8% per annum (SADC Statistical Report of 2018). However, inflation remains high and stood at around 18.6% increase between 2018 and 2019.There are cross country variations in inflation rates, with some SADC Member States recording double-digit rates – Zimbabwe (607.1%), Angola (16.6%), Malawi (11.5%), and Zambia (10.3%) over the 2018-2019 period. The lowest inflation rate was recorded in Mauritius and Seychelles at 1.6%. The importance of agriculture to social and economic growth, poverty reduction, food security, and nutrition remains central to the region's overall developmental agenda.

Ocean and inland waters (seas, lakes, rivers and reservoirs) provide significant benefits to humanity, and these include: i) food and nutrition security from fisheries and aquaculture, ii) economic and social development from fisheries and aquaculture, marine and coastal tourism, shipping, mining, energy and iii) ecosystem services such as carbon sequestration, water filtration, atmospheric and temperature regulation, protection from erosion and extreme weather events. However, the asset base of oceans and inland waters has been eroding rapidly because of overfishing, pollution from land-based sources, mangrove deforestation, infra-structure development, urbanization, climate change and ocean acidification. Hence, realizing the full potential of the oceans and inland waters requires a paradigm shift to embrace a new, responsible and sustainable approach that is more environmentally, socially and economically effective. This comes at a crucial time when the need for food, medical

drugs and resources from the ocean and inland waters is increasing rapidly to meet the needs of the growing population.

Implementing the Blue Economy requires a "toolbox" with a number of existing, new and often better strategies (African Union 2012; Commission of the European Communities 2007; UNECA 2016). These include integrated maritime strategies and policies, integrated coastal management, marine protected areas etc. One of the highly rated and promoted tools is known as ecosystem-based marine spatial planning (Douvere & Ehler 2006; Domínguez-Tejo et al. 2016). It has been argued that the Blue Economy makes its strongest gains when leveraging existing institutional relationships to address strategic gaps that affect multiple sectors and players, and which catalyze visible benefits for them in the long term (UNEP 2015). Ecosystem-based management, marine spatial planning (MSP), integrated coastal management (ICM) and the establishment of marine protected areas (MPAs) are established elements in support of the Blue Economy.

1.2 Aims and Objectives

1.2.1. Aims

The study aims to give an overview of the Maritime Domain Awareness (MDA) in the SADC Coastal and Island States, about its development, approval, and implementation, as well providing a mechanism for the application of MDA as a tool for sustainable blue economy.

1.4.2. Objectives

The overall objective of the Consultancy is to conduct a think tank study on Maritime Domain Awareness (MDA) in the SADC Region as part of the Blue Economy Toolbox.

1.5. Limitations

The study was conducted over a short period of time, and it is dependent on already existing information (desktop study), thus relies heavily on the willingness of member states to share the required information.

1.6. Assumptions

There is commitment from Member States and other relevant stakeholders to provide necessary information and data, and that there is readily available technical information and data from national, regional and international research institutions, universities, the Blue Economy sector and the media.

1.7. Risks

Delays in appointment of consultants; appointment of a consultant with limited understanding of the Blue Economy sector especially on areas of Marine Spatial Planning, Integrated Coastal Management and Marine Domain Awareness in the SADC region.

1.8. Compilation of the Report on MSP

This study is a desktop study heavily relying on the existing information on Maritime Domain Awareness (MDA) in SADC for the 6 Coastal and 4 Island states. Existing knowledge was synthesized in the context of SADC and draws also from international best practices in countries where MDA is fully implemented and operational. Most of the maps used are drawn by the author of the report, if not then the maps are fully referenced. Infographics used were also developed by the author, adopting from existing information on MDA. Therefore, the study is primarily based on secondary

data compiled through comprehensive desk research of publicly available materials at national, regional and continental

levels. Official reports, books and articles were examined, and national and regional policies, frameworks, strategies and practices analysed. In some cases, consultations through direct communication with officials and experts, telephone conversations and email exchanges have been employed for clarification and verification of information.

CHAPTER 2: Literature Review

2.1 Overview

The literature review for the for the MDA study has followed the well-established review process as depicted in Figure 1. The African continent through the African Union has developed the Continent's Blue Economy Strategy, which speaks to the African Continent's natural resources endowment, which if managed sustainably could bolster Africa's income generation to support her social and economic development, which in turn supports the efforts to achieve the united Nations' Sustainable Development Goals (SDGs). Therefore, it is imperative for the African Regional Bodies to support these efforts. As such the Southern African Development Community (SADC) has taken up challenge heads-on to develop the SADC Blue Economy Strategy, which should be a cornerstone of this development agenda in support members states. However, in order to achieve the implementation of the blue economy strategy, there are some tools that are needed to facilitate the process and attain the highest rewards from the Blue Economy. One such tools is the Maritime Domain Awareness (MDA). Therefore, at all levels (individual countries, regional, continental, and international) there is an increasing demand for decision makers to deliver on a wide range of social, economic, and environmental objectives with respect to marine and coastal space (Gacutan et al., 2022) as well as maritime security to secure activities of the blue economy. With a more globally connected economy and our nation's continued reliance on the global maritime environment for trade and commerce, ensuring a safe and secure maritime environment is critical to national security and economic well-being.

Figure 1: Literature review process for the MDA study.

Maritime Domain Awareness (MDA) is a very important part of Coastal States' maritime law enforcement campaign pertaining to strengthening marine security – both internally as well as internationally. The Maritime Domain Awareness is a very wide and encompassing subject and therefore merits a special mention while maritime security of nations is taken into account.

The main goal and the objective of the Maritime Domain Awareness is to collect the maximum information and intelligence about any ship or vessel in the country's waters. With the collected data, a complete inference can be drawn about all those marine areas that could cause potential damage with respect to safety, ecosystem and the economic system. This process is known as 'actionable intelligence.

Through actionable intelligence, it becomes possible for the rightful authorities to ensure proper maritime law enforcement. Additionally, along with this aspect, the MDA also deals extensively in matters pertaining to anti-piracy methods, smuggling of drugs through the marine channels and other unlawful activities that could be carried out through marine transportation.

There is a need for collaboration amongst all marine security sector to ensure that proper Maritime Domain Awareness is achieved. Maritime law enforcement requires serious overhauling because of the way terrorism and other unlawful activities such piracy is being carried out in recent times. Through this tool (MDA), it is possible for SADC Coastal and Island States to ensure that their marine borders are not infiltrated and that any potential risk is removed right at the beginning.

2.2 MDA technological evolution

Marine Domain Awareness involves collectively using technological aid to help better maritime law enforcement. Some of the technological devices that are utilised as a part of the Maritime Domain Awareness are as follows:

- Automatic Identification System (AIS)
- Long range radars
- Long range Unmanned Aerial Vehicles (UAV)

In addition to these existing technological aids, there are several others that feature in the pipeline to ensure a wider bracket of maritime law enforcement. Some of these proposed gadgets are as follows:

- Technology that will enable verification and confirmation of ships and passengers before the same embark from ports abroad
- Smart boxes: These boxes have sensors that are in-built which will help the authorities to screen about any weapons and other unlawful objects being carried into the ship.

2.3 What are the Challenges with MDA?

Presently the major challenge to the MDA is that proper synchronisation and combination of the information thus gathered is collated appropriately, so that it can be viable to numerous countries across the world. These countries play a vital role because in their absence of due to their lack of proactive participation, an effective Maritime Domain Awareness cannot be achieved.

Such challenges are being met and many more steps are being thought out to make sure that Maritime Domain Awareness becomes a more than substantial effecter of maritime law enforcement. This will potentially enable more countries to create such a security enforcement campaign in the coming years for their marine areas (https://www.globalsecurity.org/intell/systems/mda.htm).

2.4 Understanding Information Sharing

"Information sharing" is a rather generic term. It refers to the transmission of data, information or knowledge across space and between individuals and organizations. The notion of "information" is often contrasted with the concepts of "intelligence" or "evidence", with the latter terms referring to information which is classified or not available in the public domain due to security concerns or ongoing criminal investigations and prosecutions. A further concept used in maritime security is that of "information fusion". This refers to attempts not only to distribute information, but to bring together and combine different sources in one stream. To organize information sharing for maritime security, two concepts have been developed: "Maritime Domain Awareness" (MDA) and "Maritime Situational Awareness" (MSA). Both refer to activities that lead to a shared picture and interpretation of what happens at sea (Bueger, 2015).

In the USA, MDA is defined as the effective understanding of anything associated with the maritime domain that could impact the security, safety, economy, or environment of the United States (MDA, 2005). The maritime domain is defined as all areas and things of, on, under, relating to, adjacent to, or bordering on a sea, ocean, or other navigable waterway, including all maritime-related activities, infrastructure, people, cargo, and vessels and other conveyances. MDA means finding the ships and submarines of friends and foes, understanding the entire supply chain of cargoes, identifying people aboard vessels, understanding the infrastructures within or astride the maritime domain, and identifying anomalies and potential threats in all these areas(Bueger, 2015).

MDA and MSA grasp very similar activities. Yet, they have slightly different connotations and hence agencies differ over which term they use and how. MDA is the broader term, and, as given in the definition of the maritime domain above, goes beyond analysing what happens at sea, but rather focuses on everything connected to the maritime. In contrast, MSA emphasizes space and time (situations) and is hence more oriented towards operations, incidents, real-time analysis and rapid reactions. The focus of MSA is hence more directly related to understanding what is going on at sea. In consequence, MDA is often understood as the broader notion which subsumes MSA (Lim, 2007).

2.5 Challenges and Opportunities in MDA

MDA is a major technological challenge. Big data from different sources and in different formats - satellites, radar, reconnaissance planes or humans - have to be stored and fused. Data need to be securely stored in central databases. User portals are required to make data accessible. Algorithms are needed for visualization, reporting, incident statistics or trend analysis. Massive amounts of data on all aspects of maritime activity must be collected, then cross-referenced, 'fused' (correlated across sources), and analyzed, in order to detect anomalies that may indicate threat-related behavior"(Alsawalqa & Venter, 2022; Becker et al., 2015; H. B. Hamad,

2016c). Developing this dimension will be an ongoing task for science and technology, and computer scientists specifically. MDA is, however, not a question of algorithms, software and technology alone. It also raises questions about trust, identity, organizational cultures, interests and bureaucratic routines, as well as power constellations or political interests and how these shape MDA activities. MDA is hence a socio-political challenge, too. It concerns the willingness to share data, to engage in joint interpretation and to use these interpretations for action. To disentangle the socio-political dimension and the associated challenges, three questions need to be posed. First, among whom is information shared. Second, what information is shared? Third, by what mechanisms is a common interpretation or shared understanding of the information developed? (Bueger, 2015).

2.6 Who are the key players in MDA?

MDA centers are confronted with the sheer number of agencies engaged in maritime security. Each of these maritime security agencies has a different organizational interest and culture, as well as different bureaucratic procedures. If this is already problematic on a national level, it is magnified on a regional or global level. The cross-sectorial nature of maritime security, moreover, implies a number of divides have to be bridged which have been identified as especially problematic. This concerns, firstly, the civil-military divide. Military actors are involved in maritime security and so are a broad range of civilian ones, ranging from police and border agencies to port authorities or environmental regulators (Bueger, 2015). An impressive body of literature shows how difficult civil-military coordination is, given, for instance, misperceptions, or different cultures and routines. Within a national as well as international context, e.g. in peacekeeping operations, it is often heavily contested whether civil or military agencies are in the lead. A second set of challenges relates to a public-private divide, that is, the coordination between state agencies and the shipping industry. Shipping is, by its very nature, a globalized industry. Because of the rise of open registries and the flag state principle of the United Nations Convention on the Law of the Sea (UNCLOS), shipping is a heavily self-regulated industry that often escapes state control — although counter-terrorism provisions, such as the International Ship and Port Facility Security (ISPS) code have started to reverse this relationship (Goulielmos & Anastasakos, 2005; Henk & Fallmyr, 2020; Tzannatos, 2003). In the volatile and highly competitive shipping markets, state regulations are largely seen as a cost factor. Consequently, the industry often views state initiatives with suspicion. It is important to keep in mind that the state-industry relation varies over different maritime security issues. In the case of piracy, the shipping industry is mainly a victim and hence more inclined to cooperate. With maritime security issues such as terrorism, illegal migration, the proliferation of weapons of mass destruction (WMD), or other questions of trafficking, the industry is to a lesser degree the core victim and is even a potential perpetrator. On these kinds of issues companies will be less likely to seek cooperation with states. These dimensions make the industry-state relation intricate. The problem is exacerbated by the rise of private security companies (Liss, 2014). Many shipping companies prefer to pay for services such as maritime security reports or risk analysis, rather than relying on those provided by the state. Finally, if international information sharing is at stake, it is important also to be wary about general political dynamics between states, which is the third challenging divide. Maritime security information sharing does not operate in a

vacuum. It is heavily influenced by the general relations between states and their national interests. Disagreements, tensions, historical friendships and animosities, alliances and cooperative agreements, or struggles over influence, all potentially shape the quality of information sharing in significant ways (Bueger, 2015).

2.7 What Information is Shared in MDA?

It is imperative to distinguish the information meant to be shared. The first basic type of information are reports of incidents at sea. Many incidents are in the public domain and reported by the media, so information sharing might only imply channeling such reports through a common network. Other reports might come from the maritime industry or law enforcement agencies. Reporting incidents will have certain regional geographical limits, might include territorial waters or only focus on the high seas. What type of incidents are included is the next question. According to Bueger (2015) the information sharing might be limited to one issue, for instance, to piracy, or include a broader range, such as fishery crimes, migration or smuggling incidents (Bueger, 2015). The information might include only actual incidents, e.g. in the case of piracy, attempted and successful boarding, or also cover suspicious activities. How incidents are reported also differs in terms of the contextual information and the details provided. This includes also the question of whether post-incident data is provided, e.g. on the criminal investigations that follow, or whether prosecutions lead to sentences. The speed of sharing incident data has to be considered as well. If shared in real-time, incident data can be used for alerts as well as to coordinate responses. If only shared as post-incident data, it is mainly useful for identifying trends and patterns.

Secondly, the information concerning movements at sea in more general terms. The data provided by the international tracking systems is essential (Bueger, 2015). Most vessel movememnet globally is tracked by the Automatic Identification System (AIS), which is a short-range tracking system based on ship sensors, and have been compulsory since 2005 for any international voyaging ships with gross tonnage of 300 or more, according to the International Convention for the Safety of Life at Sea.

The Long-Range Identification and Tracking (LRIT) system is a satellite-based ship tracking system compulsory since 2009 for passenger ships and cargo vessels above 300 gross tonnages engaged on international voyages. All these systems provide basic information on larger movements at sea. Apart from the two mentioned systems, the other means of surveillance by satellites, air reconnaissance or radar are required to provide data sources for tracking smaller ships, such as fishing or leisure vessels, as well as the vessels not complying with international regulations (Bueger, 2019; Canyon & Mcmullin, 2012; Lim, 2007; Liss, 2014). AIS and LRIT are internationally standardized and available data sources; beyond that data provision on movements at sea differs in terms of what kind of vessels (commercial, fishing, yachts, dhows, etc.) are included. It is also a question of more sensitive data such as on the employment of military assets and patrol vessels.

Thirdly, a layer of information concerning more sensitive data, such as data from criminal investigations or intelligence operations, which can also potentially be shared in the frame of MDA. There are major hindrances in sharing this type of information. For the case of criminal investigations there might be legal concerns and sharing information might hamper ongoing investigations. For intelligence data, one of the major problems is that countries often

hesitate to share information since it might reveal information about their ability to collect intelligence. Therefore, a harmonized sensitive information sharing model needs to be devised at a Regional level, with links to continental bodies.

2.8 The SADC Maritime Security Strategy

The SADC Coastal and Island states are not spared from issues of piracy. There have been some incidences of such as the hijacking of Vega 5 by Somali pirates in the Mozambique Channel, the SADC Troika asked the State Security Sub-Committee of the Inter-State Defence and Security Committee (ISDSC) to draft guidelines towards a regional action plan for combating piracy (Africana et al., 2013; Ginga, 2020). It was followed by the Summit of Heads of State and Government held in Windhoek which gave mandate to the creation by the ISDSC of an assessment team to establish the extent of the threat. The team, comprising representatives of Zambia, South Africa, and Mozambique, assisted by the SADC Secretariat, produced a series of recommendations as well as a Draft Action Plan (Africana et al., 2013). Based on that plan, the Joint Defence and Security Committee and State Security Sub-Committee met in Pretoria, South Africa, to develop a SADC Maritime Security Strategy. The strategy was formally adopted by the summit of Heads of State held in Luanda, Angola, in August 2011, and is currently in force. The Strategy is geared towards the eradication of Somali piracy of Southern Africa as the priority, securing the west coast of Southern Africa as second, and "securing Southern Africa's vast rivers and lakes, such as the Congo River and Lake Tanganyika, which are vital to trade and development," as the third. The strategy consists of two main components: military deterrence and intelligence-gathering.

Military deterrence consists of the deployment of South African naval means to patrol the coast of Northern Mozambique and Southern Tanzania (Alsawalqa & Venter, 2022) after an agreement signed among the three countries in the beginning of 2012. Since then, under Operation Copper, a South African naval vessel has been permanently stationed off the coast of Pemba in northern Mozambique, together with a maritime patrol aircraft and a maritime surveillance helicopter(Alsawalqa & Venter, 2022).

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CHAPTER 3 Methodology

3.1 Study Area

The study area for the MDA study consisted of the six (6) SADC Coastal and four (4) Island States (Figure 2).

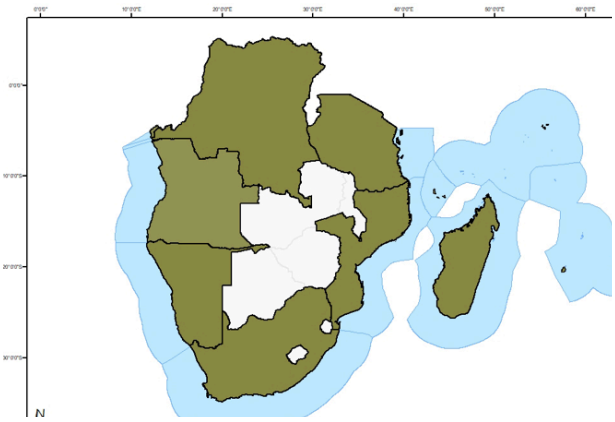

Figure 2: Depicts the study area/ countries in olive shaded colour (Democratic Republic of Congo; Angola, Namibia, South Africa, Mozambique, Tanzania, Madagascar, Mauritius, Comoros, and Seychelles). Source: Map drawn by S.K. Mafwila, 2022.

3.2 Methodological Approach

The study used the blended mode of data collection and collation, by applying triangulation strategy. Identification of Stakeholders was performed, and these stakeholders assisted in sharing information from sources such as:

a. Government Institutions dealing with Blue Economy

b. Regional Centres for Maritime Security

c. Ministry of Defence, especially the Navy

d. Police Departments

e. Immigration Department

f. Interpol

This information once collated was synthesized into various chapters of the report. Furthermore, situation analysis was conducted in order to determine and describe the past, present and future situations with regards to Maritime Domain Awareness (MDA). Therefore, the study was primarily based on secondary data compiled through comprehensive desk research of publicly available materials at national, regional and continental levels. Official reports, books and articles were examined, and national and regional policies, frameworks, strategies and practices analysed. In some cases, consultations through direct communication with officials and experts, telephone conversations and email exchanges have been employed for clarification and verification of information.

3.3 Situation Analysis for MDA in SADC region

The situation analysis is basically the process of critically evaluating the internal and external conditions that affect an organization (in this case SADC), which is done prior to a new initiative or project. It provides the knowledge to identify the current opportunities and challenges to your organization, service or product. This in turn helps with devising a strategy to move forward from your current situation to your desired situation. We have applied this method here to understand the current situation in terms of MSP in SADC countries and what the future may hold for the member states.

Furthermore, the Maritime Domain Awareness (MDA) entails the ability to comprehend what is happening in the maritime domain, including illegal activities such as piracy, smuggling, and human trafficking, among others. In the Southern African Development Community (SADC) region, MDA is a critical concern given the strategic importance of the region's ports, waterways and marine resources driving a thriving Blue Economy. A situation analysis for MDA in the SADC region would involve examining various factors that affect the region's ability to maintain MDA. These factors include:

a. ***Legal and regulatory frameworks:*** The SADC region has various legal and regulatory frameworks that govern maritime activities. However, these frameworks are often poorly enforced, and there is a lack of coordination among member states. Additionally, the absence of comprehensive regional maritime security strategy makes it difficult to develop a coherent approach to MDA.

b. ***Maritime infrastructure:*** The region's ports and waterways are critical to the movement of goods, services, and people. However, many ports are poorly equipped and maintained, leading to inefficiencies and vulnerabilities that can be exploited by criminal networks. There is a need for increased investment in infrastructure to improve the region's ability to maintain MDA.

c. ***Human resource capacity:*** There is a shortage of skilled personnel, including coastguard officers, port security personnel, and maritime domain awareness experts, to support MDA efforts. Additionally, there is a need for increased collaboration and information sharing among different agencies responsible for maritime security.

d. ***Technological capabilities:*** The region lacks modern technologies such as Automatic Identification System (AIS) and Long-Range Identification and Tracking (LRIT), which are critical to MDA efforts. There is a need for increased investment in technology to enhance MDA.

e. ***Transnational criminal networks:*** The SADC region is a transit hub for various criminal networks, including drug traffickers, smugglers, and pirates. These networks take advantage of weak governance structures, corruption, and porous borders to operate in the region. There is a need for increased cooperation among member states to combat these networks.

f. ***Climate change:*** Climate change is affecting the region's maritime environment, including rising sea levels, ocean acidification, and changing weather patterns. These factors have implications for the region's ability to maintain MDA, and there is a need to develop strategies to address these challenges.

MDA is a critical concern for the SADC region, given the strategic importance of the region's ports and waterways. To improve MDA, there is a need for increased investment in infrastructure, technology, and human resource capacity. Additionally, member states must improve coordination and cooperation to combat transnational criminal networks and address the challenges posed by climate change.

CHAPTER 4: Defining MDA

4.1 Definitions of MDA

There exist many definitions of Maritime Domain Awareness, whereby they all seem to encompass the common areas of interest in terms of the development of the Maritime Domain Awareness. SADC is regional body which would have a more holistic definition for the MDA, whereas the member states in their quest to develop their national MDA could define MDA in line with their ocean-based activities, which could lead to differences from country to country.

From the developers of the idea and framework for MDA, the USA defines it as "the effective understanding of anything associated with the maritime domain that could impact the security, safety, economy, or environment of a nation or region". Something that shows some variation with the NATO definition of: Maritime Situational Awareness (MSA) which is defined as "the understanding of military and non-military events, activities and circumstance within and associated with the maritime environment that are relevant for current and future NATO operations and exercises" (Ko-cielski, 2007).

4.2 SADC's definitions of the maritime domain and MDA

At a Regional level, SADC, there is no SADC definition for Maritime Domain Awareness (MDA), however, at a Continental level, African Union, there are some definitions although not exclusive of Maritime Domain Awareness. The African Union have developed the African Integrated Maritime Strategy 2050 (AIMS) which deals with the aspects of Maritime Domain Awareness. SADC has the Integrated Maritime Security Strategy (IMSS), which is in line with the components of the MDA, and it aims to achieve the same goals and objectives.

4.3 The SADC's Maritime Domain Awareness (MDA)

The SADC Coastal and Island states are not spared from issues of piracy. There have been some incidences of such as the hijacking of Vega 5 by Somali pirates in the Mozambique Channel, the SADC Troika asked the State Security Sub-Committee of the Inter-State Defence and Security Committee (ISDSC) to draft guidelines towards a regional action plan for combating piracy (Africana et al., 2013; Ginga, 2020). It was followed by the Summit of Heads of State and Government held in Windhoek which gave mandate to the creation by the ISDSC of an assessment team to establish the extent of the threat. The team, comprising representatives of Zambia, South Africa, and Mozambique, assisted by the SADC Secretariat, produced a series of recommendations as well as a Draft Action Plan (Africana et al., 2013). Based on that plan, the Joint Defence and Security Committee and State Security Sub-Committee met in Pretoria, South Africa, to develop a SADC Maritime Security Strategy. The strategy was formally adopted by the summit of Heads of State held in Luanda, Angola, in August 2011, and is currently in force. The Strategy is geared towards the eradication of Somali piracy of Southern Africa as the prime priority, securing the west coast of Southern Africa as second, and "securing Southern Africa's vast rivers and lakes, such as the Congo River and Lake Tanganyika, which are vital to trade and development," as the third. The strategy consists of two main components: military deterrence and intelligence-gathering.

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4.4 Status of MDA in SADC Coastal and Island States

The situation analysis of the SADC Coastal and Island States is shown in Table 1. To date, all the Coastal and Island States have some form of Maritime Domain Awareness (MDA), although the comprehensiveness of the MDA tend to vary in individual states. Thus, concerted efforts are required to harmonised through regional efforts.

Country	Type	ICZM	MSP	MDA
Angola	Coastal	Yes	Underway	Yes
Comoros	Island	Yes	Underway	Yes
DRC	Coastal	X	Underway	Yes
Madagascar	Island	Yes	Yes	Yes
Mauritius	Island	Yes	Yes	Yes
Mozambique	Coastal	Yes	Underway	Yes
Namibia	Coastal	Underway	Underway	Yes
Seychelles	Island	Yes	Yes	Yes
South Africa	Coastal	Yes	Yes	Yes
Tanzania	Coastal	Yes	Yes	Yes

Table 1. Showing the status of MDA and related activities in SADC Coastal and Island States. ICZM: Integrated Coastal Zone Management; MSP: Marine Spatial Planning; MDA: Maritime Domain Awareness; X: no information available.

4.4.1 Angola

Angola has made some progress in establishing Maritime Domain Awareness (MDA) capabilities but there are still gaps in the country's ability to effectively monitor its maritime domain. In recent years, Angola has taken steps to improve its MDA, such as establishing a National Maritime Security Committee and implementing a new Maritime Security Strategy. The country has also participated in various regional and international initiatives to enhance maritime security, including the Gulf of Guinea Commission and the Yaoundé Code of Conduct.

However, there are still challenges that Angola faces in developing its MDA capabilities. These include limited resources for maritime surveillance and monitoring, a lack of coordination among different government agencies responsible for maritime security, and gaps in data sharing and communication among stakeholders.

It is possible that there have been further developments in Angola's MDA capabilities, but to lack of available desktop information, there is limited access to information even through the surveys that was conducted.

4.4.2 Comoros

There is lack information on MDA in the Comoros, limited access to real-time data and the latest updates on the status of Maritime Domain Awareness in Comoros. However, some general information on Maritime Domain Awareness and its importance for Island States like Comoros.

Comoros is an archipelago nation located in the Indian Ocean, and its economy heavily relies on the sea, making it vulnerable to various maritime security threats. The government of Comoros has taken steps to improve its MDA capabilities by partnering with international organizations like the International Maritime Organization (IMO) and the Indian Ocean Commission (IOC) to enhance its maritime surveillance and intelligence capabilities.

In recent years, Comoros has also signed several agreements with neighboring countries and international partners to improve its MDA. For example, in 2020, Comoros signed a memorandum of understanding with India to enhance maritime security cooperation, including sharing of information and intelligence.

Overall, it appears that the country has recognized the importance of MDA and is taking steps to improve its capabilities to ensure the security and safety of its maritime domain.

4.4.3 Democratic Republic of Congo (DRC)

As of 2021, the Democratic Republic of Congo (DRC) had made limited progress in developing Maritime Domain Awareness (MDA) capabilities.

The DRC has a small coastline along the Atlantic Ocean, but its maritime sector is not well developed. The country lacks the resources and infrastructure necessary for effective MDA, such as adequate maritime surveillance systems, communication equipment, and trained personnel.

However, the government has expressed interest in improving its MDA capabilities and has taken some steps in this direction. In 2018, the DRC signed a Memorandum of Understanding with the United States to improve maritime security and combat illegal fishing in Congolese waters. Additionally, the DRC participated in the Africa Endeavor 2018 exercise, which focused on improving

communication and information-sharing between African nations to enhance maritime security.

While the DRC has shown some willingness to improve its MDA capabilities, it faces significant challenges in developing the necessary infrastructure and resources to effectively monitor its maritime domain.

4.4.4 Madagascar

Based on the available information, Madagascar has been working on improving its maritime domain awareness (MDA) capabilities in recent years.

Madagascar is an island nation located in the Indian Ocean and has a long coastline of approximately 5,000 kilometers. The country has recognized the importance of maritime security and has taken various measures to improve its MDA capabilities.

One of the key initiatives taken by Madagascar was the establishment of the Regional Maritime Information Fusion Centre (RMIFC) in 2017. The RMIFC is located in Antananarivo and is responsible for collecting, analyzing, and disseminating information related to maritime security in the region. The center is supported by international partners, including the United States and France, and has been providing training to Madagascar's maritime security agencies.

In addition to the RMIFC, Madagascar has also been working on improving its maritime patrol capabilities. The country has acquired new patrol boats, and its naval forces have been conducting joint exercises with foreign navies to enhance their operational capabilities.

Overall, while there may still be challenges in fully implementing effective MDA capabilities, Madagascar appears to be taking positive steps towards improving its maritime security.

4.4.5 Mauritius

As of September 2021, the Mauritius government had implemented a number of measures to enhance its Maritime Domain Awareness (MDA). MDA refers to the effective understanding of activities and events within a country's maritime domain that could impact its security, economy, environment, or any other national interests. Mauritius is an island nation located in the Indian Ocean, and therefore, it is particularly vulnerable to maritime threats such as piracy, illegal fishing, drug trafficking, and smuggling.

The Mauritian government has established a National Coast Guard and Maritime Surveillance System to enhance its MDA. This system comprises of a network of coastal radars, cameras, and Automatic Identification System (AIS) receivers that provide real-time monitoring and tracking of vessels within the country's territorial waters. The system is also equipped with patrol boats and aircraft that can be rapidly deployed to investigate suspicious activities and respond to incidents.

In addition, Mauritius has signed a number of international agreements and partnerships to improve its MDA capabilities. These include agreements with the United States and India to enhance maritime security cooperation, as well as partnerships with the European Union and the Indian Ocean Commission to combat maritime piracy and other illegal activities.

Overall, Mauritius has taken significant steps to improve its Maritime Domain Awareness capabilities. It is possible that further developments have occurred since then, since there is no further information available.

4.4.6 Mozambique

Mozambique is a country with a long coastline and a rich maritime environment. Its economy relies heavily on maritime activities, such as fishing, shipping, and the exploitation of offshore natural resources. However, Mozambique faces various maritime security challenges, including piracy, illegal fishing, and drug trafficking. These issues can have significant economic, environmental, and social impacts on the country.

To address these challenges, Mozambique has been working to improve its Maritime Domain Awareness capabilities. This includes investments in technology, such as radar systems and Automatic Identification Systems (AIS), which help monitor vessel movements and identify potential threats. Mozambique has also been collaborating with international partners, such as the United States, to strengthen its maritime security capabilities and improve its ability to respond to maritime incidents. In March 2023, SADC launched the SADC Fisheries Monitoring, Control, and Surveillance Coordination Centre in Maputo, Mozambique, which is a step in the right direction.

In summary, Mozambique recognizes the importance of Maritime Domain Awareness and has been taking steps to enhance its capabilities in this area.

4.4.7 Namibia

As of 2021, Namibia had made progress in improving its maritime domain awareness (MDA) capabilities, but there were still some gaps and challenges that needed to be addressed.

Namibia's location along the Atlantic coast makes it strategically important for shipping and fishing industries, as well as for security concerns such as piracy and illegal activities. To address these challenges, Namibia has taken steps to improve its MDA capabilities.

In 2016, the Namibian government established the National Maritime Information and Coordination Centre (NMICC) to enhance its MDA. The NMICC serves as a central point for collecting, analyzing, and disseminating information related to maritime activities in Namibia's waters. The center is responsible for monitoring vessels, detecting potential threats, and coordinating responses to incidents.

In addition to the NMICC, Namibia has also been working to enhance its physical infrastructure, such as improving its port facilities and acquiring new surveillance equipment. However, there are still challenges that need to be addressed, such as limited resources and personnel to cover the vast coastline.

Namibia has made progress in improving its MDA capabilities, but there is still work to be done to address the gaps and challenges in this area.

4.4.8 Seychelles

Seychelles had made significant progress in enhancing its Maritime Domain Awareness (MDA) capabilities.

Seychelles is a small island nation located in the western Indian Ocean, and its economy is heavily dependent on its maritime resources. In recent years, Seychelles has become increasingly concerned about the security of its waters, particularly with regards to illegal fishing, piracy, and other criminal activities.

To address these concerns, Seychelles has been investing in a range of MDA capabilities, including radar systems, vessel tracking technologies, and information sharing

platforms. The country has also established a Maritime Operations Centre (MOC) to coordinate its maritime security efforts.

In addition to these measures, Seychelles has also been working closely with other countries in the region to share information and coordinate operations. For example, the country is a member of the Indian Ocean Commission, which is a regional organization focused on promoting maritime security and economic cooperation.

Overall, Seychelles has made significant progress in enhancing its MDA capabilities in recent years, and the country continues to work towards further improvements to ensure the safety and security of its maritime domain.

4.4.9 South Africa

South Africa has made significant strides in improving its Maritime Domain Awareness (MDA) capabilities in recent years. The country has recognized the importance of effective MDA for national security, economic development, and the protection of its marine environment.

One of the key initiatives taken by South Africa to enhance MDA is the establishment of the Maritime Rescue Coordination Centre (MRCC) in Cape Town. The MRCC serves as the country's primary point of contact for all maritime search and rescue operations, and it plays a crucial role in ensuring the safety of mariners in South African waters.

Another significant development in South Africa's MDA efforts is the launch of the Operation Phakisa program in 2014. The program aims to accelerate economic growth in the country's oceans sector through a series of initiatives, including the development of a national ocean and coastal information management system.

Furthermore, South Africa has also been actively involved in various international initiatives aimed at improving MDA. For instance, the country participates in the Indian Ocean Rim Association's (IORA) Working Group on Maritime Safety and Security, which focuses on promoting cooperation among member states to enhance MDA in the region.

There is still room for improvement, South Africa's efforts to enhance its MDA capabilities are commendable and demonstrate the country's commitment to ensuring a safe, secure, and sustainable maritime environment.

4.4.10 Tanzania

Tanzania had made significant progress in enhancing its maritime domain awareness capabilities. The country has invested heavily in modernizing its maritime infrastructure, including the construction of new ports and the acquisition of advanced surveillance systems. Tanzania has also established a Maritime Rescue Coordination Centre (MRCC) to oversee search and rescue operations in its waters. The MRCC is equipped with state-of-the-art communication systems and is staffed by highly trained personnel.

In addition, Tanzania has signed several international agreements and protocols aimed at enhancing maritime security and safety. These include the Djibouti Code of Conduct and the East African Standby Force Maritime Security Strategy.

Overall, Tanzania's efforts to improve its maritime domain awareness have been lauded by international organizations, such as the International Maritime Organization (IMO), which has commended the country for its commitment to promoting maritime safety and security.

CHAPTER 5: Context and background to SADC Maritime Domain Awareness (MDA).

5.1 Africans Perspective of Maritime Domain Awareness (MDA)

At a Continental level, Africa has developed its Integrated Maritime Strategy 2050, which deals with matters of Maritime Security. A multi-stakeholder approach was taken by Africa in developing the AIMS 2050. In developing the 2050 Africa's Integrated Maritime (AIM) Strategy, it is recognized that the African Maritime Domain (AMD) has vast potential for wealth creation. It also recognizes that AU Member States have common maritime challenges and opportunities, and indeed, significant responsibilities for generating the desirable political will for implementing the strategy.

The objectives of the 2050 AIM Strategy are as follows:

- Establish a Combined Exclusive Maritime Zone of Africa (CEMZA)
- Engage civil society and all other stakeholders to improve awareness on maritime issues
- Enhance political will at community, national, regional and continental levels
- Enhance wealth creation, and regional and international trade performance through maritime-centric capacity and capability building
- Ensure security and safety of maritime transportation systems
- Minimize environmental damage and expedite recovery from catastrophic events
- Prevent hostile and criminal acts at sea, and Coordinate/harmonize the prosecution of the offenders
- Protect populations, including AMD heritage, assets and critical infrastructure from maritime pollution and dumping of toxic and nuclear waste
- Improve Integrated Coastal Zone/Area Management in Africa
- Promote the ratification, domestication and implementation of international legal instruments
- Ensure synergies and coherence between sectoral policies within and between the RECs/RMs
- Protect the right of access to sea and freedom of transit of goods for landly-connected States.

Taking a closer look at this commitment from the AU, the strategy cuts across several pertinent issues, which if managed properly would generate enough wealth to sustain Africa and her people. Concerted efforts have to be taken to secure the Combined Exclusive Maritime Zone of Africa (CEMZA). Therefore, this strategy forms a basis under which African Regional Bodies such SADC, would refine and align their Maritime Security Strategy. Compatibility of the maritime security systems is key to successful convergent coordination and implementation of the strategies.

5.2 The SWOT analysis of MDA in SADC region

Strengths:

- Strategic location: The SADC region is strategically located on the southern coast of Africa, with access to the Indian Ocean and South Atlantic Ocean.
- Rich maritime resources: The SADC region has a rich array of maritime resources, including oil and gas reserves, minerals, fish and other marine life, and shipping lanes.
- Increasing awareness: There is a growing awareness of the importance of maritime security and the need for effective Maritime Domain Awareness (MDA) in the SADC region.
- Regional cooperation: The SADC region has a history of regional cooperation and collaboration, which can be leveraged to enhance MDA.

Weaknesses:

- Limited resources: Many SADC countries have limited resources and capabilities to effectively monitor and patrol their maritime borders and territorial waters.
- Inadequate infrastructure: The lack of adequate infrastructure, such as ports, communication systems, and surveillance technologies, can impede effective MDA in the region.
- Political instability: Some SADC countries have experienced political instability, which can undermine their ability to effectively enforce maritime laws and regulations.
- Limited maritime expertise: Many SADC countries lack the necessary expertise and training to effectively manage their maritime resources and enforce maritime laws and regulations.

Opportunities:

International partnerships: The SADC region has opportunities to partner with international organizations and countries to improve MDA capabilities and access to resources.

Technology advancements: The rapid advancement of technology, including remote sensing and artificial intelligence, presents opportunities to enhance MDA capabilities in the region.

Economic development: Investment in maritime infrastructure and resources can drive economic development in the SADC region.

Tourism potential: The SADC region has significant potential for maritime tourism, which can generate revenue and promote economic growth.

Threats:

Illegal activities: The SADC region is vulnerable to illegal activities such as piracy, drug trafficking, and illegal fishing, which can undermine maritime security and economic development.

Climate change: Climate change and its impacts on sea level rise, ocean acidification, and changes in weather patterns can have significant implications for maritime activities in the region.

Geopolitical tensions: Geopolitical tensions in the region can affect maritime security and lead to conflicts over maritime resources.

Cybersecurity threats: The increasing reliance on technology for MDA can make the region vulnerable to cybersecurity threats, including hacking and data breaches.

5.3 SADC's maritime nature

The SADC maritime domain, comprised of both combined Exclusive Economic Zone (EEZ) and Continental Shelf area (approximately 8 035 464 km2), is greater than the combined land area of the littoral and island states (approximately 7 976 282 km2). The land area is further slightly reduced when including the significant lacustrine territory of countries such as Tanzania, Malawi and the DRC. By total EEZ size, a combined SADC EEZ would be the fifth largest in the world and the total land area of SADC member states is only 17% greater than the total size of the maritime domain (SADC, 2021). Although this study is focussing on SADC Coastal and Island States only, it is important to mention that SADC recognises that its region is endowed with a rich range of freshwater and marine areas of biodiversity, encompassing lagoons, mangrove forests marshes, estuaries, deltas, lakes, rivers and other marine ecosystems. Mangrove forests for instance play a very important protective function to the coastline and are also key ecosystems for the breeding of marine fisheries. The maritime zone is rich in natural resources and provides significant employment and livelihood for millions of inhabitants of the region. It is therefore a critical life support system for the region, providing a primary source of food for local populations (SADC, 2021). The maritime domain also serves as the source of energy through oil and gas industry; supports 90% of trade, especially the transnational and international trade; magnificent coastlines and good weather conditions attracts tourism, eventually creating jobs to millions of people in the region.

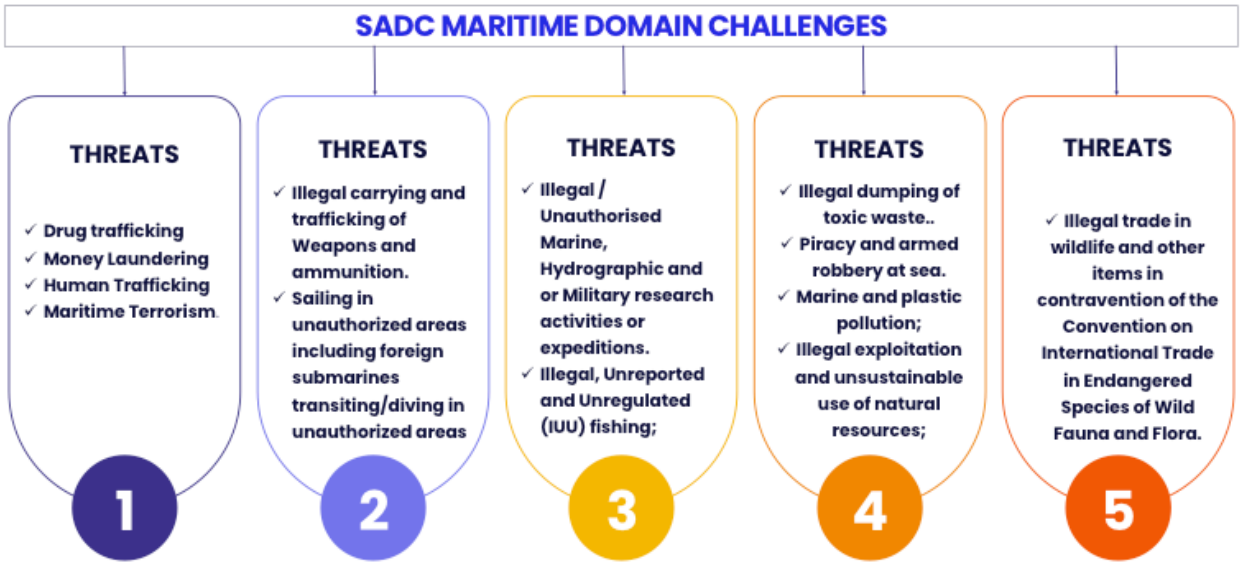

Figure 3: The main maritime security threats in the SADC region (adopted from SADC, 2021).

All the activities listed in Figure 3 tends to undermine the efforts to reap the benefits of the Sustainable Blue Economy. SADC member states whether landlocked and coastal states have seen the need for an Integrated Maritime Security Strategy (IMSS).

The modern concept of the Blue Economy (BE) is set to achieve this dual objective with the promise that the more environmentally and socially sustainable a BE activity is, the more economic and durable benefits it will generate. A successful BE is also the one that integrates and coordinates sectoral strategies with institutional, planning and regulatory frameworks to achieve a cohesive and effective waterways and ocean governance.

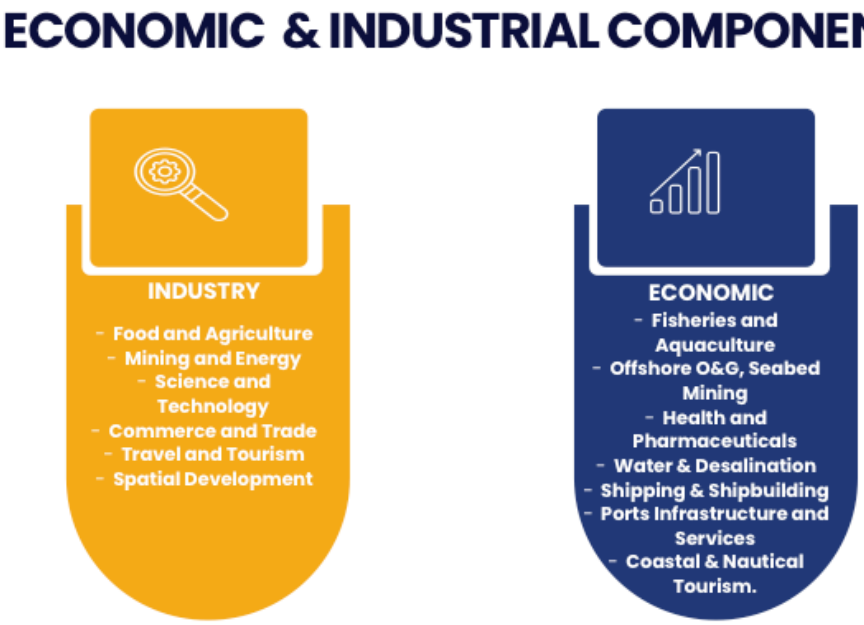

Figure 4: Industrial and Economic Component of the Blue Economy

Figure 5: Environmental and Social Sustainability of the Blue Economy.

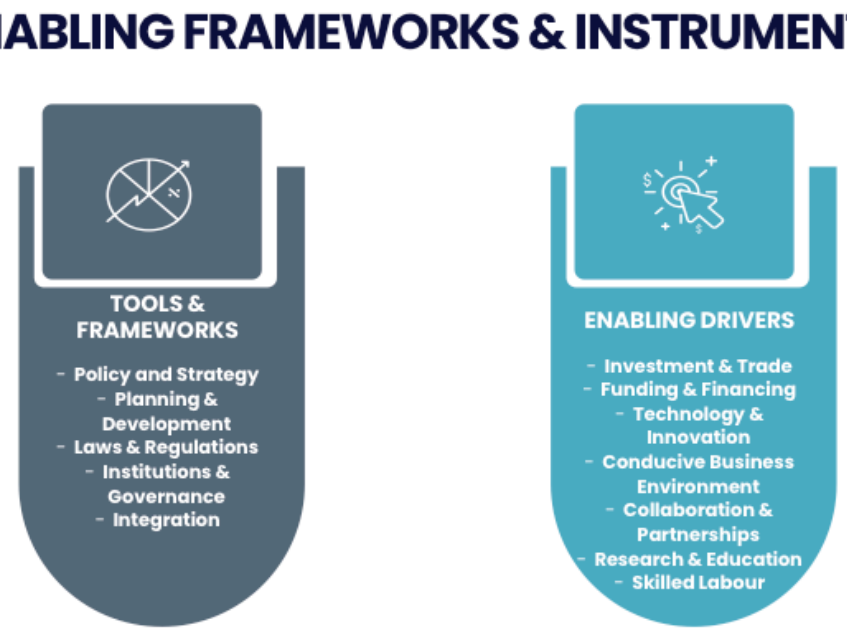

Figure 6: The Enabling Framework & Instruments of the Blue Economy: Sectors, Sustainable component, and enabling drivers (adopted from Bichou, 2022).

To this end, the BE must encompass at least 4 pillars or components (Figures 4 – 6):

- » An economic and service component that integrates relevant BE activities and resources,
- » An environmental and conservation component that underpins and manages the environmental sustainability of ocean and waterway spaces and ecosystems,
- » A social component that incorporates the social, cultural and livelihood needs of coastal, lake and river communities, and
- » An enabling and management component that establishes and oversees the tools and mechanisms needed to manage, coordinate and implement BE strategies and interventions (Bichou, 2022).

5.4 Case studies on the MDA effectiveness

5.4.1 General Case Studies

General Case Studies

Maritime Domain Awareness (MDA) refers to the effective understanding of anything related to the maritime domain that could impact the security, safety, economy, or environment of a country. MDA includes activities such as vessel tracking, monitoring of coastal waters, intelligence gathering, and law enforcement. Here are some examples of case studies in MDA:

a. Tracking of Piracy and Illegal Fishing in West Africa The Gulf of Guinea has been one of the most dangerous regions for piracy and illegal fishing in recent years. To combat this, several West African countries have joined forces to improve their MDA capabilities. They have established joint maritime operations centers and invested in new technology such as automatic identification systems (AIS) and satellites for tracking vessels. This has led to a significant reduction in piracy incidents and illegal fishing activities in the region.

b. Protecting the Great Barrier Reef from Illegal Shipping The Great Barrier Reef in Australia is one of the world's most important natural treasures. However, it is under threat from illegal shipping activities, such as illegal anchoring and dumping of waste. To prevent this, the Australian government has implemented a comprehensive MDA system that uses a combination of radar, cameras, and satellite imagery to track vessels in the area. The system also includes a reporting mechanism that enables members of the public to report any suspicious activities.

c. Monitoring Maritime Traffic in the Persian Gulf The Persian Gulf is one of the world's busiest shipping lanes, with a large volume of oil and gas being transported through the region. The United Arab Emirates (UAE) has invested heavily in MDA to monitor this traffic and prevent any security threats. The UAE's MDA system includes a network of coastal radars, cameras, and satellites that provide real-time information about vessel movements in the region. This has enabled the UAE to respond quickly to any security threats and maintain the safety of the region.

d. Combating Illegal Immigration in the Mediterranean The Mediterranean has been a major route for illegal immigration from North Africa to Europe. To combat this, the European Union (EU) has implemented an MDA system that includes vessel tracking, surveillance, and intelligence gathering. The system also includes cooperation with countries in North Africa to prevent the departure of illegal immigrants. The EU's MDA system has been successful in reducing illegal immigration and improving the security of the Mediterranean region.

e. Preventing Maritime Terrorism in Southeast Asia Southeast Asia has been a target for maritime terrorism, with several incidents occurring in recent years. To prevent this, countries in the region have implemented MDA systems that include vessel tracking, surveillance, and intelligence gathering. They have also established joint operations centers and improved communication and cooperation between countries. These efforts have led to a reduction in maritime terrorism incidents in the region.

These case studies demonstrate the importance of MDA in maintaining the safety, security, and economic prosperity of maritime regions around the world.

CASE STUDY: COMOROS (Small Island State)

Maritime Domain Awareness (MDA) refers to the effective understanding of maritime activities in a given area, including the movement of vessels, cargo, and people. In the context of Comoros, MDA is critical for the country's security, economic growth, and environmental protection.

The Comoros archipelago is located in the western Indian Ocean, near major shipping lanes. It consists of four main islands, and its Exclusive Economic Zone (EEZ) covers an area of approximately 390,000 square kilometers. Due to its strategic location, Comoros faces various maritime security challenges, such as piracy, illegal fishing, drug trafficking, and human trafficking.

To enhance MDA in Comoros, several initiatives have been taken in recent years.

These include:

a. Installation of Automatic Identification System (AIS) stations: Comoros has installed AIS stations on its four main islands to track vessel movements in its territorial waters. The AIS stations provide real-time information on vessel identity, position, speed, and course.

b. Capacity building for maritime law enforcement agencies: Comoros has received support from international organizations such as the United Nations Office on Drugs and Crime (UNODC) and the International Maritime Organization (IMO) to enhance the capacity of its maritime law enforcement agencies. The training includes maritime interdiction, boarding and search, and evidence collection.

c. Collaboration with neighboring countries: Comoros has signed several bilateral and regional agreements with neighboring countries to enhance maritime security. For instance, Comoros has signed an agreement with Madagascar to share information on maritime security, fisheries management, and environmental protection.

d. Participation in regional initiatives: Comoros is a member of several regional initiatives aimed at enhancing MDA in the western Indian Ocean. For instance, Comoros is a member of the Regional Maritime Security Programme (MASE), which aims to improve maritime security in the region.

In conclusion, the enhancement of MDA in Comoros is critical for the country's security, economic growth, and environmental protection. The initiatives taken by Comoros, such as the installation of AIS stations and capacity building for maritime law enforcement agencies, are steps in the right direction. However, more needs to be done to effectively address the maritime security challenges facing the country.

CHAPTER 6: Some Key MDA efforts in the SADC Region

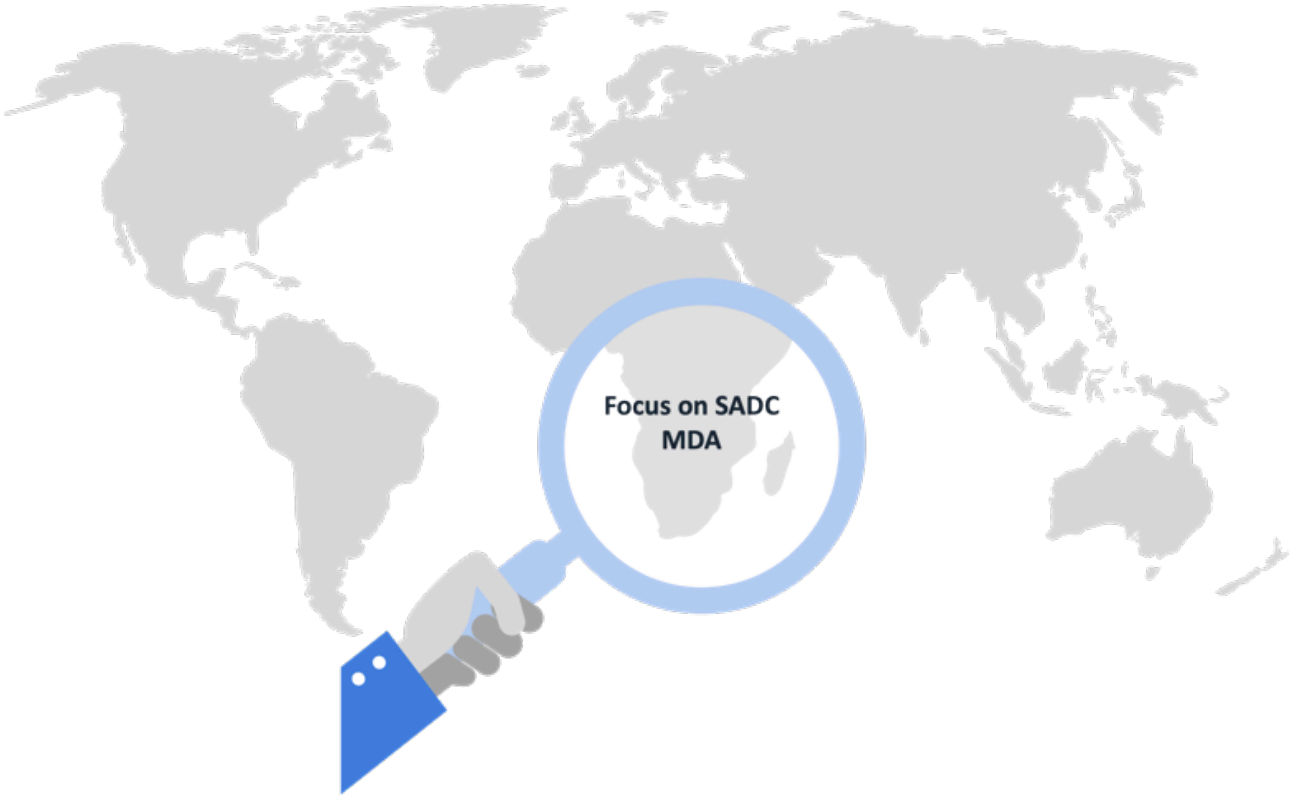

Figure: Region of interest for MDA efforts in SADC.

The Southern African Development Community (SADC) region is a group of 16 countries located in southern Africa, and there are several key maritime domain efforts that are being undertaken in the region to promote maritime security, economic growth, and environmental sustainability. SADC has made some strides in terms of MDA efforts and some of the major initiatives in this regard includes the following:

- **The African Integrated Maritime Strategy (AIMS) 2050:** This is a continental strategy that aims to promote the sustainable use of Africa's maritime domain and to leverage the potential of the blue economy for economic development. The SADC region is a key partner in this initiative, and is working to implement various programs and projects to enhance maritime security, support the blue economy, and protect the marine environment.
- **The SADC Maritime Security Strategy:** This strategy is focused on promoting the safety and security of the maritime domain in the SADC region, including preventing and combating maritime crime, enhancing border control, and improving coordination among national and regional maritime authorities.
- **The SADC Regional Fisheries Monitoring, Control and Surveillance (MCS) Programme:** This program is designed to combat illegal, unreported

and unregulated (IUU) fishing in the region by improving the monitoring, control and surveillance of fisheries activities. This Centre which will be based in Maputo, Mozambique will play a pivotal role in SADC's quest adequate MCS in the region. The SADC Monitoring, Control and Surveillance Charter for establishing the SADC MCS Centre has entered into force in April 2023.

- **The SADC Port and Corridor Development Programme:** This initiative seeks to promote the development of regional ports and transport corridors to enhance trade and economic growth in the region. This includes improving port infrastructure, streamlining customs and border procedures, and promoting private sector investment in the sector.
- **The Benguela Current Commission:** This is a regional organization that is focused on promoting the sustainable management of the Benguela Current marine ecosystem, which spans the coasts of Angola, Namibia and South Africa. The commission works to support scientific research, environmental monitoring and conservation efforts in the region.

All these initiatives represent important efforts to promote the sustainable development of the maritime domain in the SADC region, and to address the many challenges and opportunities that are associated with this vital sector.

Furthermore, SADC subscribes to various international and regional bodies which are relevant for good collaboration with various key players and frameworks for MDA. All the SADC Coastal and Island States have signed various international and regional conventions, codes, charters, strategies and frameworks that encourage the establishment and institutionalisation of information-sharing networks for greater MDA.

6.1 Some Key Developments in Securing the Oceans within SADC: International and Regional Agreements

6.1.1 United Nations

United Nations Office on Drugs and Crime (UNODC)

The Indian Ocean Forum on Maritime Crime, which focuses on promoting strategic and operational cooperation in the fight against maritime crime, was the brainchild of the United Nations Office on Drugs and Crime (Haysom, 2018, UNODC, 2019). The growing threat of drug trafficking in the region is also prompting greater collaboration between afflicted regional states.

6.1.2 Interpol

Interpol plays a crucial role globally, and it is a platform which remains relevant to the efforts and initiatives of the SADC MDA. Interpol is custodian of a Global Maritime Security Database that contains information on maritime piracy incidents, fisheries crimes and other crimes occurring in the maritime domain.

The main objectives of the database are to:

- Collect and store piracy and other maritime crime information
- Analyse information related to maritime crime
- Produce intelligence products
- Develop relationships

Therefore, continued collaborations with Interpol is crucial for the implementation of SADC's MDA strategy. For example: Interpol coordinated Operation Spindrift in

in South Africa in 2014, which targeted the illegal transnational trade in abalone through information and intelligence exchange among seven countries: Australia, Canada, New Zealand, Norway, South Africa, the UK and the US, and the operation was success due good collaboration of these countries in rooting out the illegal abalone trade (Stopillegalfishing, 2016).

6.1.3 The International Maritime Organization and the Djibouti Code of Conduct

Multilateral information-sharing mechanisms for greater maritime security were established largely in response to the threat piracy and armed robbery at sea posed to maritime shipping in the 1990s and 2000s. About 19 littoral countries of SADC, eastern Africa and the Arabian Peninsula are signatory to the Djibouti Code of Conduct (DCoC). The DCoC was drafted and adopted in January 2009, calling on signatory states to cooperate to repress piracy and armed robbery against ships in the Western Indian Ocean and the Gulf of Aden. The parties to the DCoC adopted a revised Code of Conduct, known as the Jeddah Amendment to the Djibouti Code of Conduct 2017, or DCoC(J), in January 2017.

The DCoC(J) provides a non-binding framework for signatory states to cooperate as much as possible to repress transnational organised crimes including piracy and armed robbery at sea, maritime terrorism, illegal, unreported, and unregulated fishing, arms and narcotics trafficking, the illegal wildlife trade, illegal oil bunkering and theft, human trafficking and smuggling and the illegal dumping of toxic waste.

This can be a challenge for some signatory states, as implementation requires them to re-examine their national networks to go beyond the traditional maritime transport administration focus towards one that can adequately address the issues posed by increasing transnational maritime crime (Walker and Reva, 2020).

6.1.4 Virtual Regional Maritime Traffic Centre and Trans-regional Maritime Network

This Network facilitates information sharing, primarily of AIS data, between members on the movement of commercial vessel traffic or 'white shipping'. For instance, South Africa is one of the centre's few external members, and the information this provides further complements South Africa's ability to track vessels operating in, or approaching, its waters. This demonstrates that more SADC Coastal and Island States could join the Network to complement their national observation and command centres. As of December 2018, the Indian Navy as one of the leads within the Indian Ocean, and signed an Operational Arrangement, thereby linking the Information Fusion Centre – the Indian Ocean Regional to T-RMN.

6.1.5 Indian Ocean Rim Association

The Indian Ocean Rim Association for Regional Cooperation (IOR-ARC) was founded in 1997 after the former South African President Nelson Mandela said that 'the natural urge of the facts of history and geography should broaden itself to include the concept of an Indian Ocean Rim for socio-economic cooperation and other peaceful endeavours. Recent changes in the international system demand that the countries of the Indian Ocean shall become a single platform' (Walker, 2017).

A lesser interest from key states such as South Africa, Indonesia, India and Australia was observed as IOR-ARC importance started to slump. Other organisations took the lead in developing regional MDA, especially the Indian Ocean Naval Symposium (IONS), in

which a dedicated working group covered the establishment of information sharing through developing standard operating procedures and a Maritime Information Exchange Directory (Walker and Reva, 2020). When India took the Chairmanship of the IOR – ARC, it was revived and lead to the adoption of six priority areas for members to work on enhancing together: Maritime Safety and Security; Trade and Investment Facilitation; Fisheries Management; Disaster and Risk Management; Academic, Science and Technology Cooperation; and Tourism and Cultural Exchanges.

6.1.6 The Revised African Maritime Transport Charter (RAMTC).

Chapter VIII of the Revised African Maritime Transport Charter, concerning enhancing maritime safety and security, includes numerous articles concerning the sharing of information and mutual aid with a direct bearing on MDA:

- Member states undertake to put in place an efficient maritime communication network in order to make optimum use of mechanisms for control, follow-up and intervention at sea and ensure better organisation of maritime traffic
- Member states should strive to create a strategic framework for the exchange of information and mutual assistance in order to enhance measures that can improve safety, security and prevention systems and make it possible to combat unlawful acts perpetrated at sea (AU, 2010).

However, this charter's action plan for implementation had not been rolled out due to lack of ratifications, it requires 15 more ratifications.

6.1.7 African Charter on Maritime Security and Safety and Development in Africa (Lomé Charter).

The African Charter on Maritime Security and Safety and Development in Africa (the Lomé Charter) has been adopted to address key components of the maritime security and blue economy agenda.

On 15 October 2016, African heads of state and government adopted the Lomé Charter at an AU Extraordinary Summit on Maritime Security and Safety and Development in Africa in Lomé, Togo. The Lomé Charter commits each state party to take enhanced measures to improve the security of its maritime domain through promoting coordination, such as information sharing, providing enhanced training and capacity building, harmonising national legislation and creating national maritime coordination agencies. Articles 22–25 directly impact on maritime security and information sharing. But they don't go beyond restating the need to improve maritime security and maritime domain awareness for them to be crucial enablers for maritime development and meeting Sustainable Development Goals (Walker and Reva, 2020). The Lomé Charter also doesn't provide enough support for earlier MDA proposals such as those of the 2050 AIMS. These linkages and support are crucial for the greater benefit of member states.

6.1.8 2050 Africa's Integrated Maritime Strategy

The 2050 Africa's Integrated Maritime Strategy (2050 AIMS), a comprehensive plan that aims to 'foster more wealth creation from Africa's oceans, seas and inland water ways by developing a thriving maritime economy and realising the full potential of sea-based activities in an environmentally sustainable manner'.

The AU Assembly adopted the strategy in 2014 after a lengthy and wide-ranging process of consultation among African and international stakeholders (Walker, 2017). The 2050 AIMS also makes it clear that Africa's approach to the blue economy includes not only its oceans and seas, but also the continent's inland water bodies. This underscores the relevance of the blue economy for all African states, including landlocked states. The 2050 AIMS suggested the establishment of a Maritime Information and Coordination Cell (MIC2) and envisages a 'shared situational awareness capability' as an eventual outcome of its implementation. The MIC2 initiative was earlier proposed at the Fifth Ordinary Meeting of the AU's Specialised Technical Committee on Defence Security and Safety. 2050 AIMS also highlights the importance of operationalising of the Regional Maritime Operational Centres since the major impetus for information sharing will be located in the various RECs and their implementation plans. Furthermore, the 2050 AIMS envisages the promotion of inter-agency and transnational cooperation and coordination on maritime safety and security by:

- Including a naval component capacity within the framework of the African Standby Force.
- Establishing a representative continental working group of Chiefs of African Navies or coast guards (CHANS) to scrutinise issues of situational awareness and collaborate towards the enhancement of Africa's MDA, and to uphold cooperative efforts between navies/coast guards of the AU member states and international partners.

This provides for the Maritime Domain Awareness at the African Continent, thus plays an important role to the Regional Bodies such SADC. Integration of information sharing, and vessel tracking is imperative for successful MDA in SADC.

6.1.9 Global Monitoring for Environment and Security and Africa

The Global Monitoring for Environment and Security and Africa initiative is monitored and managed by the African Union (AU) through the Human Resources, Science and Technology Committee. The project is funded by the EU and includes data from the Copernicus programme – the European Space Agency programme providing earth observation services based on the data gathered from satellites and on-site measurements. The initiative aims to support African states in terms of implementing sustainable environmental policies, developing local capacity, increasing access to earth observation services and providing African decision makers with relevant information and tools. It has three

thematic areas – the long-term management of natural resources, marine and coastal areas, and water resources management (AU, 2020). Relevant to MDA is the second thematic area, which prioritises, among other things, The monitoring of coastal areas, ship traffic and pollution monitoring is crucial for MDA.

6.1.10 The SADC Maritime Security Strategy of 2011

Since the conception of the SADC Maritime Security Strategy by the SADC Summit of Heads of State and Government in Windhoek, Namibia, in July 2010, they highlighted the threat from piracy to the region. Thus, they gave a mandate to a team of experts from the Troika countries to assess the threat and devise an appropriate response mechanism to this threat. The SADC SMC (Standing Maritime Committee) then established a taskforce to evaluate available resources and response capacity and draft a SADC Maritime Security Strategy. An Extraordinary SADC defence meeting took place in Pretoria in July 2011 to further develop the strategy, which was

adopted at the Summit of Heads of State and Government in Luanda, Angola, in August 2011 (Walker and Reva, 2020).

Walker and Reva (2020) indicated in their report that from 2013 to 2017, the UN Security Council commended 'the naval activities of the Southern Africa Development Community' in its resolutions re-authorising naval patrols off the coast of Somalia. This commendation hasn't appeared in subsequent UN Security Council resolutions, despite the continuation of Operation Copper, since 2017.

A recommendation was made by the 18th Standing Maritime Committee in 2012 to establish two SADC MDA Centres – in Tanzania and at Silvermine in South Africa. To facilitate the process a Memorandum of Understanding was drawn up in order for member states to appoint permanent liaison officers and to engage in information sharing (Walker and Reva, 2020).

Various meetings of the Standing Maritime Committee (SMC) (24th and 25th SMC, 2018 and 2019 respectively) have noted the developments with regards to strategic establishment of MDA Centres and the deployment of personnel. Mozambique, South Africa and Tanzania had signed a trilateral memorandum of understanding that paved the way for maritime cooperation and the establishment of the centres. Furthermore, it was noted that a memorandum of understanding was being finalised between South Africa, Namibia and Angola. Whereas the Indian Ocean is well covered, the Atlantic MDA architecture is relatively underdeveloped. Angola and Namibia have established MDA Centres, but these are not yet interlinked (Walker and Reva, 2020). The land locked SADC countries, Botswana, Lesotho, Malawi, Zambia and Zimbabwe have also established operational frameworks to facilitate necessary links with MDA Centres according to the SMC minutes, but these are also not interlinked. The operational frameworks to facilitate this process have, however, been established (Walker and Reva, 2020).

6.1.11 SADC Regional Monitoring Control and Surveillance Coordination Centre

The SADC ministers responsible for fisheries approved the establishment of a Regional Fisheries Monitoring Control and Surveillance Coordination Centre in Mozambique in 2010. The establishment of the centre is expected to help combat illegal fishing through enhancing and coordinating compliance and enforcement efforts in the SADC region. The SADC ministers responsible for agriculture and food security, and fisheries and aquaculture, adopted the revised project plan and the Monitoring Control and Surveillance Coordination Centre Charter in May 2017. It was approved by the SADC Council of Ministers in August 2017. Good news is that the MCSC Charter has entered into force recently in April 2023. The SADC Joint Meeting of Environment and Natural Resources, Fisheries and Aquaculture, and Tourism ministers, tasked the SADC secretariat to explore the potential incorporation of FISH-i Africa into the Monitoring Control and Surveillance Coordination Centre. FISH-i Africa is a partnership of eight East African countries – Comoros, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia and Tanzania – who share information in the fight against illegal fishing in the western Indian ocean.

FISH-i Africa has been active since 2012, when the regional fisheries enforcement Task Force for countries bordering the Western Indian Ocean (WIO) became operational. By pooling information, coordinating actions and undertaking investigations, FISH-i has spearheaded a string of enforcement actions

and increased compliance in the fisheries sector. The success of FISH-i Africa has been commended regionally and internationally as the value of working together and with increased transparency is shown to be effective in challenging illegal operators. There is potential for synergy between SADC MDA centres, the SADC Monitoring Control and Surveillance Coordination Centre, and the Regional Maritime Information Fusion Centre in Madagascar and the Regional Coordination Operations Centre in Seychelles, all funded by the EU through the MASE Project.

6.1.12 Benguela Current Convention (BCC)

The Benguela Current Convention established the Benguela Current Commission (BCC) in 2007 as a permanent inter-governmental organisation. The Convention is a formal treaty for the governments of Angola, Namibia and South Africa that sets out the countries' intention to promote a coordinated regional approach to the long-term conservation, protection, rehabilitation, enhancement and sustainable use of the Benguela Current Large Marine Ecosystem in order to provide economic, environmental and social benefits. The governments of Angola, Namibia and South Africa signed the Benguela Current Convention in the Angolan city of Benguela on 18 March 2013. The BCC is the first inter-governmental commission globally based on the Large Marine Ecosystem concept of ocean governance – a move towards managing resources at the larger ecosystem level (rather than at the national level) and balancing human needs with conservation imperatives. One of the fundamental principles of the Benguela Current Convention is that the use and management of the BCLME and its resources be based on the "best scientific evidence available". As such, the BCC implements a range of research projects that collectively improve knowledge and understanding of the Large Marine Ecosystem. The Norwegian government sponsored a comprehensive BCC Science programme from 2009 to 2014. This programme was implemented by a range of partners, including the government agencies responsible for the management of ocean resources, the EAF-Nansen Project, non-governmental organizations and consultants. One of the most important features of the Science Programme is the annual Science Forum, an event that provides an opportunity for members of the BCLME science community to meet, share results and evaluate their studies. It also provides an opportunity for scientists from the region to identify areas of mutual scientific interest and discuss collaboration with their international colleagues (www.benguelacc.org).

This inter-governmental organization provides a platform for the Atlantic Ocean SADC countries to work together and implement the SADC MDA architecture.

6.1.13 Regional Maritime Information Fusion Centre (RMIFC).

The RMIFC is a regional center that collects, analyzes, and disseminates maritime information to member states. It is based in Madagascar and was established in 2013.

6.1.14 Regional Cooperation Agreement on Combating Piracy and Armed Robbery against Ships in Asia (ReCAAP).

Although ReCAAP is an agreement between Asian countries, SADC is a signatory to this agreement. ReCAAP is an information-sharing platform that aims to enhance regional cooperation and coordination to combat piracy and armed robbery at sea.

6.1.15 Multinational Maritime Coordination Centre (MMCC).

The MMCC is a joint coordination center that brings together maritime agencies from SADC member states to enhance regional coordination and information sharing. It was established in 2015 and is based in Tanzania.

These international and regional agreements aim to enhance MDA and promote maritime security in the SADC region. By working together, member states can share information and coordinate their efforts to effectively address maritime security challenges such as piracy and armed robbery at sea.

CHAPTER 7: Results of the SADC MDA survey 2023.

7.1 Background

The SADC Coastal and Island States are well endowed with natural resources, which makes the centre-stage for the sustainable development of the blue economy. Data and information sharing plays a very important role in analyses of the MDA current situation pertaining to the SADC region. Literature sources that were collated was used for the situation analysis, however there were some gaps in data, which needed and extra effort to obtain, thus a survey was conducted to supplement existing literature.

7.2 Methodology for the survey

A quasi-quantitative sampling methods was applied during the survey. Key informants were drawn from the Blue Economy Focal Point Persons from the SADC Member States covered by the study, and these were requested to participate in the survey. The participants had to give their consent to participant in the survey before proceeding with the questionnaire. Ten SADC countries (6 Coastal) and (4 Island) states were targeted for the survey. The survey ran for at least two months ending the 30 March 2023. This online survey was conducted to capture some information on the MDA of individual countries within the SADC region.

7.3 Results and Discussion

The results of the survey are shown pie charts and bar graphs below. However, the survey results show poor response (Figure 7) to the MDA section of the questionnaire, perhaps an indication of how challenging it is to obtain MDA information, either those that are supposed to share such information are not able to do so, due to perhaps the sensitivity of the information. Thus, only 23.5% response rate for this section on MDA. Therefore, these results should be used with caution, they are not represented enough.

Figure 7: Stakeholders response as to whether they can respond to questions pertaining to MDA in their country.

Figure 8: Do you have MDA in your country?

Figure 9: Is there Legal and Policy frameworks for MDA in your country?

Figure 10: Are you part of a Regional security cluster?

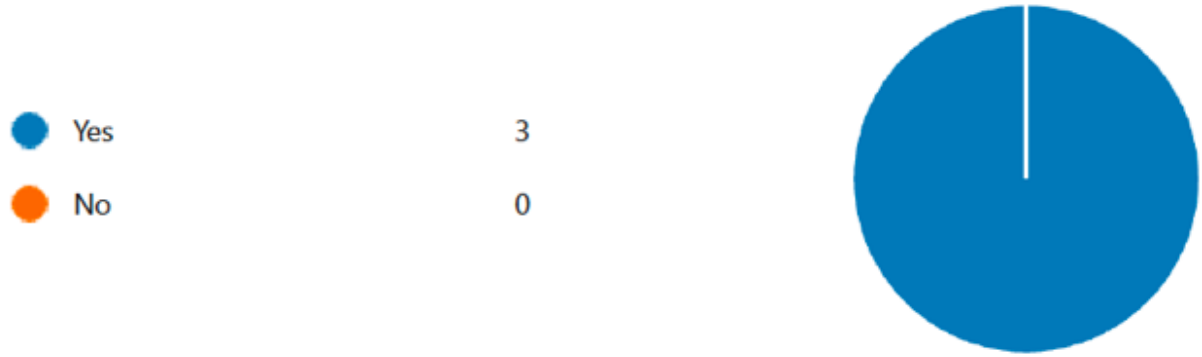

Figure 11: Do you have joint operations with other Regional Security Clusters?

Figure 12: Do you have a fully developed Navy in your country?

The following capacity needs for MDA were highlighted by respondents:

- More resources like air capability, patrol boats and warm bodies to do the actual work. Budget remains a challenge.
- Technology and training to be able to operate same
- Technology and human capacity

What kind of challenges are you facing in the implementation of your own country's maritime security strategy and the SADC Integrated Maritime Security Strategy?

- Budget constraints More organisations involved with competing interests
- Funding, relevant technology,expertise
- The implementation is a challenge due to implications to different sectors

In terms of funding the MDA programmes, Government only remains the biggest funder for MDA. It is expected for governments to fund the MDA due to the nature of some sensitive information emanating from the MDA system, which cannot wholly be entrusted on other parties. Although, there are strong collaborations in setting up and managing MDA systems especially in Africa, there is strong presence of support from outside Africa, and dependence on the European and American Satellite based information.

CHAPTER 8: The Future of SADC MDA

8.1. Background

Maritime Domain Awareness (MDA) is increasingly identified as one of the backbones of successful maritime security provision. The MDA embodies: a means of collecting information about movements at sea and maritime incidents, collating and fusing the information from different sources in order to develop a picture that can be shared with all agencies that deal with the sea, and also to produce actionable knowledge for law enforcement. It can be an important means to ensure rapid reaction to maritime events, such as incidents of armed robbery, piracy or accidents at sea. MDA is a concept and an ambition. MDA also serve to identify and predict potential threats to maritime commerce, maritime installations, the environment installation, and coastal populations. Maritime security is a transnational challenge and requires nations to work together. On a regional level, MDA allows countries to collaborate closely and develop a shared understanding of the regional maritime security issues that require a response and how to prioritise them (Bueger and Chan, 2019).

8.2 The Conceptual SADC MDA system

A successful MDA system is the one that can detect vessel movement at sea, efficient information sharing, and effective response system to incidences at sea. Thus, the basic requirement is to be able to track vessels at sea, and the globally common system is the use of AIS data through the Vessel Monitoring Systems (VMS) (Figure 13).

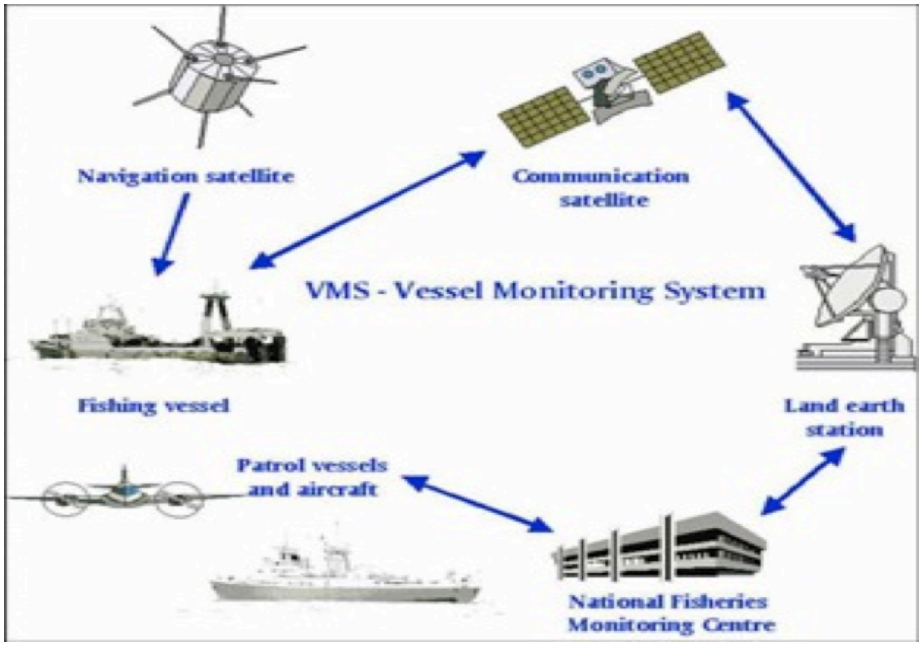

Figure 13: **Typical Vessel Monitoring System (VMS).**

SADC should seek a comprehensive system which will enables MDA stakeholders to collaboratively discover and investigate suspicious and illegal maritime activity throughout the SADC region. The system should be able to:

a. Counter Illegal, Unreported, and Unregulated Fishing (IUUF)
b. Maritime Protected Areas (MPAs)
c. Search and Rescue (SAR)
d. Critical Infrastructure Protection
e. Environmental Protection & Response
f. Maritime Law Enforcement
g. Counter smuggling (drugs, weapons, money, people)

The system should be able to protect the asset base for the Sustainable Blue Economy. Southern Africa is increasingly becoming one of major shipping hubs in the world, with most of the Coastal and Island States having critical port operations (Figures 14 & 15).

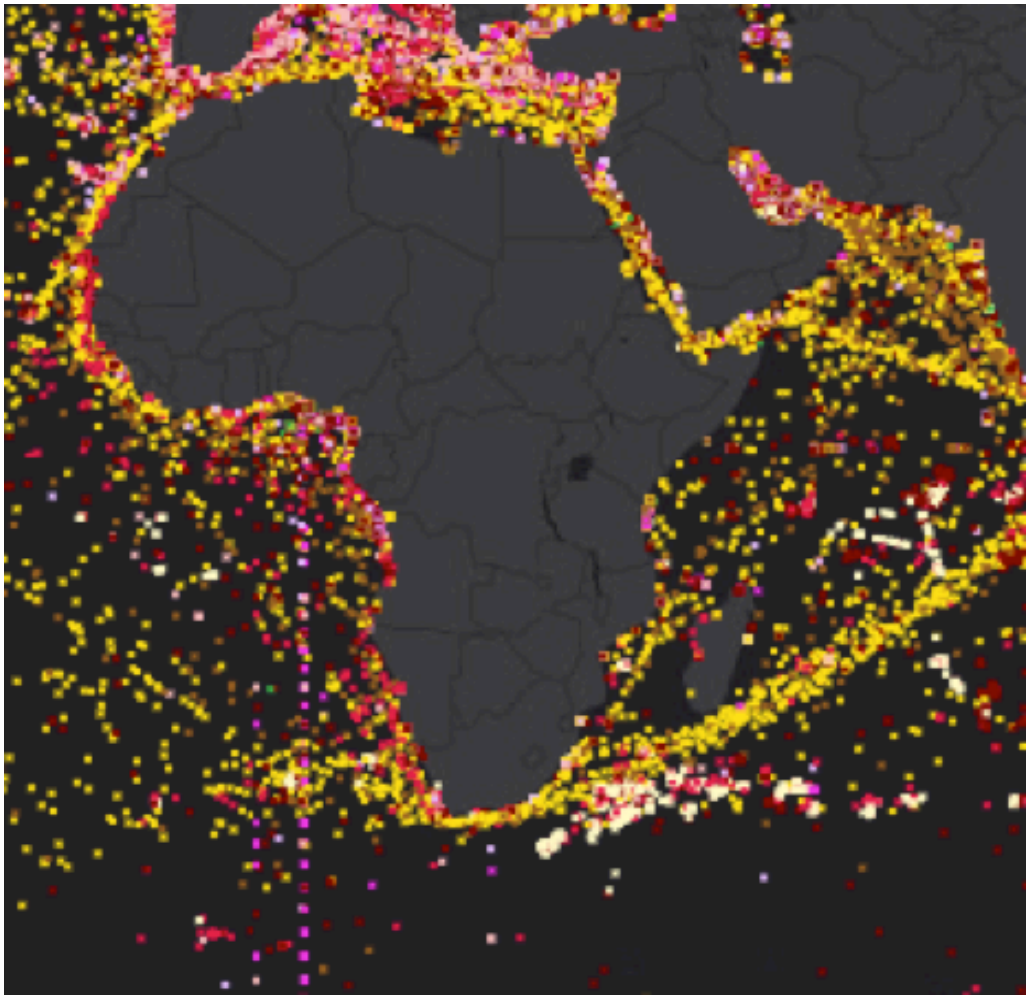

Figure 14: Footprint of shipping around Africa as captured by the Proteus system of the US Navy.

8.3 Types of Vessel Monitoring Systems

Vessel Monitoring Systems (VMS) are electronic systems that are used to track and monitor the location, movements, and activities of vessels at sea. There are several different types of VMS, including:

1. **Automatic Identification System (AIS):** AIS is a tracking system that uses radio signals to transmit and receive vessel information. AIS is mandatory for most commercial vessels and is used by port authorities and maritime organizations for vessel tracking and safety purposes.
2. **Satellite-based VMS:** Satellite-based VMS uses satellite technology to track vessels in remote areas and monitor fishing activities. The system uses a transponder installed on the vessel to send location and activity information to a satellite.
3. **Radar-based VMS:** Radar-based VMS uses radar technology to track vessels in real-time. The system can detect the position, speed, and direction of vessels and can be used to monitor vessel traffic in busy ports and waterways.
4. **Electronic Monitoring (EM) systems:** EM systems use electronic sensors and cameras to monitor vessel activity and compliance with fishing regulations. The system can be used to track vessel location, catch data, and other environmental factors.
5. **Portable VMS:** Portable VMS is a compact and lightweight tracking system that can be easily installed on small vessels. The system uses GPS technology to track vessel location and can be used by small-scale fishers to comply with fishing regulations and improve safety at sea.

Therefore, there is an array of these systems that can be adopted by SADC to set up Monitoring, Control and Surveillance (MCS) Centres in strategic locations (e.g. the one that has been launched in Maputo) and a similar Centre is needed in the Benguela Current region. These Centres would work with the already suggested and developed Maritime Information Monitoring and Sharing Centres (e.g. in Simon's town) and in Durban. These can all be linked to individual States MDA centres in the Region.

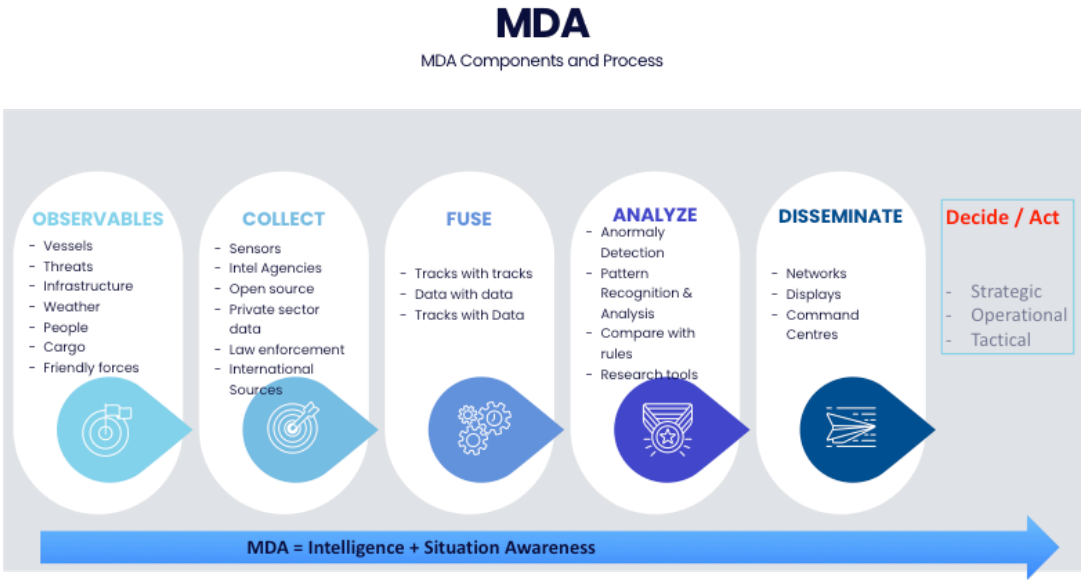

Figure 15: Suggested SADC MDA components and Process.

MDA goes further to provide data for all other uses within the Maritime Domain. It uses earth observations data which is basically a collection of data about the planet's physical, chemical, and biological properties from space, air, land, and water. The typical set of the MDA should include the following:

a. Satellite Imagery: Satellites orbiting the Earth can capture images of the planet from space, allowing scientists to study land use, climate change, and natural disasters.

b. Weather Data: Observations from weather stations and weather satellites provide information on temperature, precipitation, wind speed, and other weather-related variables.

c. Oceanography Data: Scientists use buoys, ships, and satellites to gather data on ocean temperature, currents, and sea levels.

d. Air Quality Data: Sensors on the ground and on aircraft can measure air quality, including levels of pollutants like ozone and particulate matter.

e. Land Cover Data: Earth observations can provide information on the types of vegetation, land use, and land cover across the planet.

f. Carbon Emissions Data: Satellites and other instruments can measure the amount of carbon dioxide and other greenhouse gases in the atmosphere, providing information on climate change.

g. Natural Disaster Monitoring: Earth observations can help detect and track natural disasters like hurricanes, earthquakes, and wildfires, allowing for better response and recovery efforts.

All this data is vital for the successful MDA system.

CHAPTER 9: Recommendation and Conclusion

Maritime security in Southern Africa is an important issue, as the region has a significant coastline and is home to major ports that are vital for international trade. The maritime security challenges in the region are complex and multifaceted, and include piracy, armed robbery at sea, illegal fishing, drug trafficking, and human trafficking. One of the key factors contributing to the maritime security challenges in Southern Africa is the lack of effective governance and law enforcement on the seas. Many of the countries in the region face significant economic and social challenges, which limit their ability to invest in maritime security infrastructure and resources. This creates opportunities for criminal groups to operate with relative impunity.

To address these challenges, regional and international efforts are underway to strengthen maritime security in Southern Africa. These include the African Union's Maritime Strategy, the Indian Ocean Commission's Regional Maritime Security Program, and the U.S. Navy's Africa Partnership Station. These initiatives focus on building the capacity of coastal states to monitor and control their maritime territories, improving cooperation between countries in the region, and increasing information sharing and intelligence gathering.

In addition to these efforts, there are also a number of steps that individual countries can take to improve their own maritime security. These include investing in training and equipping their coast guards and navies, strengthening their legal frameworks to prosecute maritime criminals, and improving regional cooperation and coordination.

Improving maritime security in Southern Africa is a complex and ongoing process that requires sustained regional and international cooperation and investment. By working together, countries in the region can create a safer and more secure maritime environment that supports economic growth and stability.

Maritime Domain Awareness (MDA) remains a critical tool for enhancing maritime security, safety, and sustainability. The Southern African Development Community (SADC) Sustainable Blue Economy program can benefit significantly from using MDA to manage and protect its marine resources.

The following recommendations for using MDA as a tool in the SADC Sustainable Blue Economy are not mandatory but necessary:

i. Develop a comprehensive MDA strategy: The first step is to develop a comprehensive MDA strategy that outlines the program's goals, objectives, and priorities. This strategy should identify the necessary technology, data, and human resources required to achieve the program's objectives.

ii. Establish/and or strengthen a regional MDA network: SADC countries should establish a regional MDA network that allows for the sharing of information, data, and resources. This network should include maritime law enforcement agencies, coast guards, and navies. The use of new and emerging technology should be embraced.

iii. Invest in MDA technology: Investing in MDA technology is critical for effective maritime surveillance and monitoring. The SADC program should invest in technology such as radar systems, Automatic Identification System (AIS), and

satellite imagery to improve situational awareness.

iv. Develop a maritime information-sharing platform: A maritime information-sharing platform should be established to enable the sharing of real-time data and intelligence among participating countries. This platform should also allow for the sharing of best practices and lessons learned. SADC should consider developing new Maritime Information Sharing and Coordination Centers in addition to the already existing ones. The Benguela Region of the Atlantic Ocean seems to lack behind the required coverage in terms of these developments.

v. Provide MDA training and capacity-building: MDA training and capacity-building should be provided to maritime law enforcement agencies, coast guards, and navies. This training should focus on the use of MDA technology, data analysis, and intelligence sharing.

vi. Foster public-private partnerships: Public-private partnerships can play a critical role in enhancing MDA capabilities. SADC countries should seek to foster partnerships with private companies that provide MDA technology and services. The long-term plan could be that SADC develop its own infrastructure and own the MDA composite technology and services.

vii. Strengthen MDA capabilities for countries along the Benguela region of the Southeast Atlantic and link it to all the regional MDA nodes.

viii. Earth Observation is critical for a successful MDA operation, thus investing in this technology will leverage the quality services to all the stakeholders within MDA and benefit the Blue Economy activities of the SADC Coastal and Island states.

ix. SADC Coastal and Island States should ratify the relevant international instruments and harmonise national legislation to align it with international requirements, with particular emphasis on the training of relevant actors responsible for their implementation (port state control, naval forces, coast guards, maritime safety and security agencies, customs authorities, port authorities, etc.).

x. SADC to ensure effective flag and port state control to eliminate substandard shipping practices, enhance safety and security, monitor, and ensure the protection of the marine environment against pollution, improve working and living conditions of people on board ships, ensure strict compliance with international maritime conventions.

xi. Strengthen inter-institutional and transnational cooperation and coordination on maritime safety and security. Hence the optimal and efficient use of the early warning system instituted by the African Union, the Continental Early Warning System (CEWS).

xii. Strengthening bilateral and multilateral strategic synergies.

xiii. Ensure the effective implementation of Regional Maritime Operational Centres and national coordination structures.

xiv. Ensure full implementation of the SADC Integrated Maritime Security Strategy.

By implementing these recommendations, the SADC Sustainable Blue Economy program can effectively leverage MDA to improve maritime security, safety, and sustainability. All these MDA activities would require some funding, training of human capital, and infrastructure development. It is critical for SADC to offer safe operating space for the sustainable blue economy.

CHAPTER 10: References

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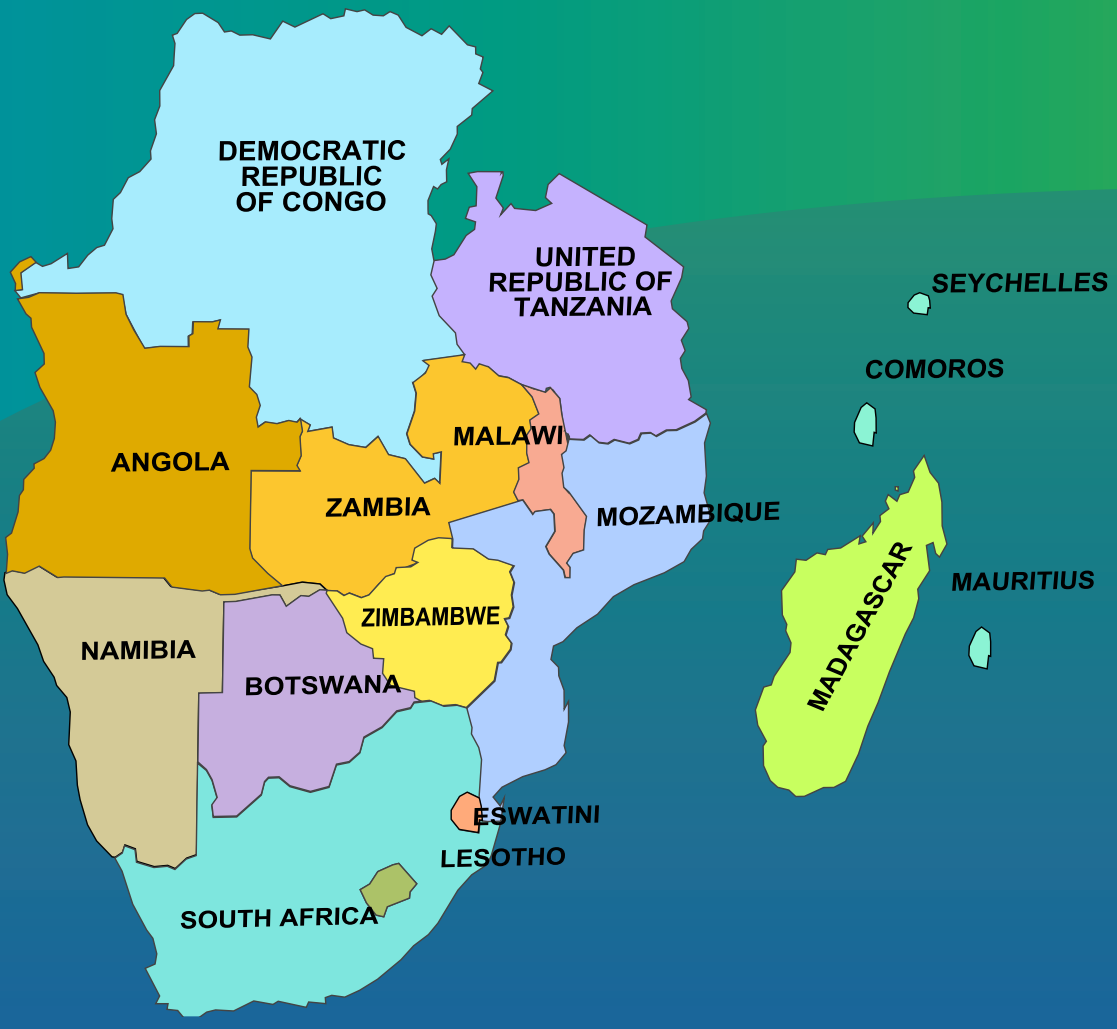
NOTES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