



Unlocking full potentials of the blue Economy: Are African SIDS ready to embrace the opportunities?



United Nations
Economic Commission for Africa

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ABBREVIATIONS

AIMS	Atlantic, Indian, Mediterranean and South China Sea
BE	Blue Economy
BPOA	Barbados Programme of Action
CDM	Clean Development Mechanism
EEZ	Exclusive Economic Zone
EITI	Extractive Industries Transparency Initiative
ENSO	El Niño Southern Oscillation
FDI	Foreign Direct Investment
GE	Green Economy
GDP	Gross Domestic Product
GHG	Greenhouse Gas Emissions
IUU	Illegal, Unreported and Unregulated
LDCs	Least Developed Countries
LSCI	Liner Shipping Connectivity Index
MFC	Microbial Fuel Cells
MOI	Mauritius Oceanographical Institute
MSI	Mauritius Strategy of Implementation
NAMAs	Nationally Appropriate Mitigation Actions
REDD	Reducing Emissions from Deforestation and Forest Degradation
SIDS	Small Island Developing States
SLR	Sea Level Rise
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNFCCC	UN Framework Convention on Climate Change

SUMMARY

The ocean and coastal zones are of great importance to Small Island Developing States (SIDS). In recent years there has been an increasing focus on the emerging concept of the “Blue Economy” based on the original development within the UN of the concept of the “Green Economy”. SIDS regard the blue economy approach to offer a sustainability approach that is better suited for their particular circumstances, constraints and challenges. The Blue Economy advocates the same desired outcome as the Green economy namely: “improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities” (UNEP, 2012). The Blue Economy focusses on areas such as: fishing; shipping and maritime transport; coastal tourism; marine energy (fossil and renewable); pharmaceutical and cosmetic industries, genetic resources and general sea-based products; and blue carbon trading opportunities. The BE approach thus offers the prospect of sustained environmentally sound but also socially inclusive economic growth based on SIDS strengths in coastal and marine sectors. The six African SIDS: Cape Verde, Comoros, Guinea-Bissau, Mauritius, São Tomé and Príncipe; Seychelles are all highly dependent on coastal and marine sectors. The Blue Economy sectors in the different nations are in different faces of development. The countries face challenges in developing some sectors while others provide great potential. The objective

FIGURE 1. LOCATION OF THE SIX AFRICAN SIDS: CAPE VERDE, COMOROS, GUINEA-BISSAU, MAURITIUS, SÃO TOMÉ AND PRÍNCIPE, AND SEYCHELLES.



of this report is to examine the importance of the BE for African SIDS and the future challenges and opportunities this sector entails for African SIDS. As there is no global blue economy strategy currently this report also adds to the global blue economy strategy for SIDS in general. This report will present: 1) present the vulnerability of African SIDS; 2) a description and potential of each BE sector; 3) the challenges the different sectors face; and 4) provide recommendations.

INTRODUCTION

Small Island Developing States (SIDS) are small island or low-lying coastal countries located in the tropical and subtropical regions (partly) surrounded by oceans (Boto & Biasca, 2012). SIDS are considered a separate group by the UN as they share similar sustainability challenges related to their specific characteristics such as; smallness; isolation; remoteness; susceptibility to natural disasters; vulnerability to external shocks; excessive dependence on international trade (Guillotreau, Campling, & Robinson, 2012; Mimura et al., 2007; L Nurse et al., 2014).¹ There is no common accepted definition of what constitutes SIDS (Boto & Biasca, 2012; Polido, João, & Ramos, 2014). For this report we focus on the 52 SIDS that are officially recognized by the UN.² Of the 52 UN recognized SIDS, 23 are located in the Caribbean, 20 in the Pacific and 9 in the Atlantic, Indian, Mediterranean and South China Sea (AIMS) of which 6 are located in Africa (see table 1 and figure 1).³

SIDS were first formally recognized as a distinct group by the United Nations in 1992 at the Conference on Environment and Development held in Rio de Janeiro in Brazil (Boto & Biasca, 2012). In 1994 the first UN Global Conference on the Sustainable Development of SIDS was held in Bridgetown, Barbados (Boto & Biasca, 2012). The conference adopted the Barbados Programme of Action (BPOA) which identified 14 priority areas and the necessary actions taken at the national, regional and international level.⁴ In 2005 the Mauritius Strategy for Further Implementation of the Programme of Action for Sustainable Development of SIDS (MSI) was adopted identifying further critical

areas in the BPOA and new emerging issues (Boto & Biasca, 2012). The MSI further strengthened the social and economic dimensions for the BPOA by placing more emphasis on matters such as health, culture, knowledge management, education for sustainable development, and consumption and production. It also emphasized the importance of trade and trade liberalization for SIDS as well as a focus on the graduation from least developed country status (UN, 2005). The MSI was followed by the MSI +5 in 2010 which consisted of several regional meetings as well as two interregional meetings. The last meeting adopted a political declaration that elaborates new and renewed commitments to implement BPOA and MSI (Earth Negotiations Bulletin, 2013).

Despite SIDS common characteristics, they are by no means homogenous, varying by geography, physical, climatic, social, political, cultural, and ethnic character as well as level of economic development (Nurse et al. 2001). There are three groups of SIDS within the UN classification of SIDS. This classification is based on geographical location and comprises Caribbean SIDS; Pacific SIDS and a groups under the header Atlantic, Indian, Mediterranean and South China Sea (AIMS) (see table 1). African SIDS (Cape Verde, Comoros, Guinea-Bissau, Mauritius, São Tomé and Príncipe, and Seychelles) represent six out of nine SIDS the other 3 are scattered across the other oceans. The AIMS group (9 SIDS) is smaller than the Caribbean (23 SIDS) and Pacific (20 SIDS) group and in publications and documents has received less attention.

THE BLUE ECONOMY

The marine environment provides a myriad of services to humans ranging from food security, livelihood and employment, cultural services, climate regulation, as well as storm protection for coastal populations. The ocean also delivers an essential service in the form of

1 See also www.sids.org

2 <http://unohrlls.org/about-sids/>

3 See also www.sids.org

4 Priority areas are: climate change and sea-level rise; natural and environmental disasters; management of wastes; coastal and marine resources; freshwater resources; land resources; energy resources; tourism resources; biodiversity resources; national institutions and administrative capacity; regional institutions and technical cooperation; transport and communication; science and technology; human resource development

TABLE 1: LIST OF SIDS CATEGORY OF SIDS

<p>Caribbean Sea (23): Anguilla, Antigua and Barbados, Aruba, Bahamas, Barbados, Belize, British Virgin Islands, Cuba, Dominica, Dominican Republic, Grenada, Guyana, Haiti,* Jamaica, Montserrat, Netherlands Antilles, Puerto Rico, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, US Virgin Islands.</p>
<p>The Pacific Ocean (20): American Samoa, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, Kiribati,* Marshall Islands, Nauru, New Caledonia, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Solomon Islands,* Timor-Leste,* Tonga, Tuvalu*, Vanuatu.*</p>
<p>Africa, Indian Ocean, Mediterranean and South China Sea (AIMS) (9): Bahrein, Cape Verde, Comoros,* Guinea-Bissau,* Maldives, Mauritius, São Tomé and Príncipe,* Seychelles, Singapore.</p>

Source: www.sids.org

‘blue carbon’ sinks such as mangrove forests, sea grass beds and other vegetated ocean habitats, –which can sequester up to five times the amounts of carbon absorbed by tropical forests (Nelleman et al., 2009). For SIDS and other coastal nations the ocean and coastal environmental thus often play a vital role in development.

In 2012 at the Rio +20 UN conference, the concept of the ‘Green Economy’ (GE), which was first launched in 1989, was further developed. The Green Economy is based in the context of sustainable development and contribute to eradicate poverty as well as sustained economic growth, enhancing social inclusion, improving human welfare and creating opportunities for employment and decent work for all while maintaining the healthy functioning of the Earth’s ecosystems. However, throughout the preparatory process for Rio +20 many coastal nations questioned whether the focus on the green economy was applicable for them and stressed a focus on the ‘Blue Economy’ (BE). The concept of Blue Economy is thus as a tool to shift development in small island development states (SIDS) and coastal states towards a sustainable development trajectory building on the Rio+20 consensus.

As a result, institutional efforts were made to expand the *Blue* aspect of the Green economy as embodied

in the ‘Green Economy in a Blue World’ report (UNEP, 2012). Coastal and island developing countries have remained at the forefront of this Blue Economy advocacy, recognizing that the BE offers an approach of sustainable development that is better suited for their particular circumstances, constraints and challenges. As they are small island nations they, for example, face limitations on extent of forests or usable arable land. SIDS do not have extensive forest that could be used for REDD+ (Reducing Emissions from Deforestation and forest Degradation) projects. However, they do often have extensive mangroves, sea grass beds and other coastal vegetation that could be used for Blue Carbon projects. As their arable land is also often limited developing agriculture to improve food security of impoverished nations can be a constraint. However, the extensive Exclusive Economic Zone (EEZ) of many SIDS and other coastal nations can provide opportunities for development of the fisheries sector.

The Blue Economy advocates the same desired outcome as the Green economy namely: ‘improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities’ (UNEP, 2012). The Abu Dhabi Declaration describes the Blue Economy as a tool to promote, inter alia, sustainable development, poverty eradication, and create sustainable livelihoods, reduce disaster risk in

coastal areas and the mitigation of, and adaptation to, climate change in small island developing States (SIDS) and coastal countries. The concept reinforces conservation and sustainable management of oceans and accompanies the green economy. The blue economy approach recognizes the productivity of healthy ocean ecosystems as a pathway for ocean-based economies, as well as ensuring that SIDS and other coastal countries benefit from their marine resources.

Fundamental to Blue Economy approach is the principle of equity ensuring that countries:

- Optimise the benefits received from the development of their marine environments e.g. fishery agreements, bioprospecting, oil and mineral extraction.
- Promote national equity, including gender equality, and in particular the generation of inclusive growth and decent jobs for all.
- Have the concerns and interests of developing countries and SIDS properly reflected in the development of seas beyond national jurisdiction; including the refinement of international governance mechanisms and their concerns as States proximate to seabed development.

The Declaration is aware of the fundamental importance of the marine environment, its biodiversity, healthy ecosystems and resources to future, inclusive sustainable development as:

- Fisheries play a vital role in providing food and nutrition security and sustainable livelihoods,
- Tourism is as a source of direct and indirect employment and a contributor to poverty alleviation,
- The provision of coastal protection by coral reef and mangrove ecosystems for storms and extreme weather events

- It provides a source of social, cultural and spiritual benefits to coastal communities.
- Provides a source of renewable energy from wind, wave, tidal, thermal and biomass sources.
- Provides a source of hydrocarbon and mineral resources.
- Is crucial and the primary means of global trade through shipping and port facilities.

The importance of oceans for sustainable development has been recognised from the beginning of the UNCED process, in Agenda 21, the Johannesburg Plan of Implementation and reaffirmed in the outcome document of the Rio+20 Conference; but ongoing trends of exploitation and degradation of marine and coastal ecosystems show that endeavours to date have been insufficient and that more needs to be and must be done.⁵ The marine environment is faced with threats to oceans, including ocean acidification, coral bleaching, depletion of oceans, habitat destruction, pollution, increasing degradation, and population rise. These challenges compromise the ability of the ocean to continue providing essential resources and critically important services. It is exactly for the reason to reverse the current trend of continuous degradation of marine ecosystem and their functionalities the concept of the Blue Economy is emerging. Enhanced management to minimize and mitigate unsustainable exploitation of marine resources is thus also part of the Blue Economy. Efficiency and optimisation of resource use are paramount whilst respecting environmental and ecological parameters.

In recent years there has been increased attention in SIDS for the 'Blue Economy'. The importance of marine and coastal resources to SIDS is evident, and has been elaborated in numerous international fora. The BE offers the potential for SIDS to alleviate one of their defining obstacles to sustainable development:

⁵ <http://sustainabledevelopment.un.org/content/documents/2978BEconcept.pdf>

FIGURE 2: MAP OF SMALL ISLAND DEVELOPING STATES RECOGNIZED BY UN



Source: http://en.wikipedia.org/wiki/Small_Island_Developing_States

namely that of a narrow terrestrial resource base. SIDS are blessed with vast ocean territories and intricate coastlines commonly have large Exclusive Economic Zones (EEZs) and coastlines in comparison to their land area. The ocean and coastal areas and all their ecosystem functions are thus of crucial importance for SIDS e.g. as a provider of food security to coastal populations and communities, for coastal tourism, as a route for maritime transport, and provision of cultural benefits.

The objective of this report is to examine the importance of the BE for African SIDS and the future

challenges and opportunities this sector entails for African SIDS. As there is no global blue economy strategy currently available this report adds to the global blue economy strategy for SIDS and that for African SIDS in particular. This report will present: 1) present the vulnerability of African SIDS; 2) a description and potential of each BE sector; 3) the challenges and potential of the different sectors; and 4) provide recommendations.

I. AFRICAN SIDS VULNERABILITY

Vulnerability is the state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt (Adger, 2006). The central idea of the often-cited IPCC definition (McCarthy, Canziani, Leary, Dokken, & White, 2001) is that vulnerability is degree to which a system is susceptible to and is unable to cope with adverse effects (of climate change). In all formulations, the key parameters of vulnerability are the stress to which a system is exposed, its sensitivity, and its adaptive capacity.

SIDS are considered vulnerable because of high levels of exposure as they are located in sub-tropical and tropical regions which is associated with high level of natural disasters and climate extremes; high sensitivity as they are smallness (population and size); remoteness, high number of population in the coastal zone; and low in adaptive capacity because of high levels of economic vulnerability due to heavy reliance on a limited number of natural resources, high import dependency and dependency on global markets; and geopolitical weakness (Boto & Biasca, 2012; Easter, 1999; Nurse et al., 2014). SIDS are by no means not homogenous however and one can expect regional differences between the SIDS from Caribbean, Pacific and AIMS SIDS. Table 1.2 compares the general

characteristics of the three SIDS groups whereby for AIMS only the six African SIDS are used.

The main difference between the different SIDS groups African SIDS is the second largest of the SIDS groups in terms of population, EEZ/landarea and % of population in the coastal zone (see table 1.2). Only the Pacific SIDS have a smaller on average population than African SIDS. Caribbean SIDS have a substantially higher number with other coastal nations having a much larger population. African SIDS are significantly lower than all other country groups in terms of landsize. in km² with the average landarea per country only 25% of the second smallest group, Caribbean SIDS. The Exclusive Economic Zone of African SIDS is large with on average 639,638 km² per country. Pacific SIDS have a larger EEZ as well as other coastal nations. The percentage of the population living within 10 km from the coastline shows that Pacific SIDS have the highest percentage with 89% closely followed by African SIDS with 84 and Caribbean SIDS with 79. Other coastal nations show significantly lower levels of population living in the coastal zone. GDP per capita on average for African SIDS is low. It is the second lowest of all groups with only Pacific SIDS having a lower GDP per capita. GDP per capita in African SIDS is approximately half that of Caribbean GDP per capita

TABLE 1.2: GENERAL CHARACTERISTICS OF THE THREE SIDS GROUPS AND OTHER COASTAL NATIONS

	African SIDS	Caribbean SIDS	Pacific SIDS	Other coastal nations
Population (average per group) ¹	757,351	1,839,885	594,189	55,525,137
Landarea km ² (2)	6,244	25,988	30,966	959,720
GDP per capita ³	8,433	15,370	7,024	21,108
EEZ ⁴	639,638	127,420	1,430,636	878,629
EEZ/landarea ⁵	664	133	3,871	437
% population 10 km from coastline ⁶	84	79	89	32

1 CIA factbook 2012; 2 WorldBank 2011; 3 Worldbank 2011; 4 www.seararoundus.org; 5 See footnote 1 and 2; 6 CIESIN 2010

and only 40% of the average GDP per capita of other coastal nations. This table has shown that African SIDS are indeed very small in landarea and population while they have a very low GDP per capita and thus express low economic adaptive capacity.

African SIDS have the highest percentage of agricultural contribution to GDP (see figure 1.1). Their public debt (as percentage of GDP) is really high in comparison to Pacific SIDS and other coastal nations, while their remittances as % of GDP is very low. Official aid as percentage of GDP is much lower than Pacific SIDS yet much higher than Caribbean SIDS. Foreign Direct Investment (FDI) is relatively high in terms of percentage of GDP.

CLIMATE CHANGE VULNERABILITY OF AFRICAN SIDS

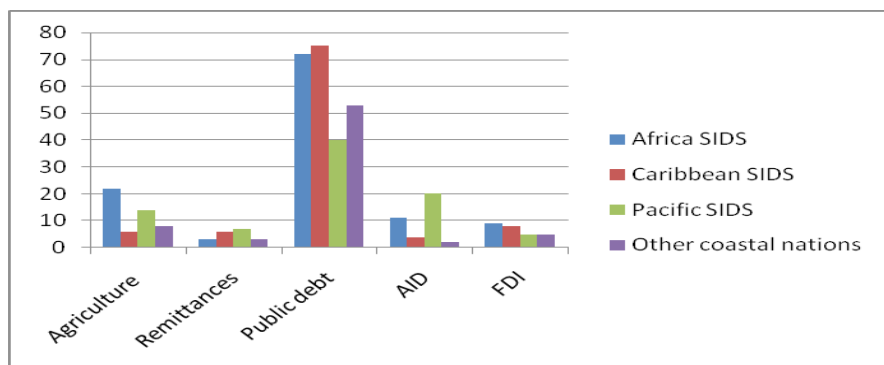
African SIDS are responsible for only 0.02 percent of GHG emissions⁶ yet they are expected to suffer from the impacts of sea level rise, ocean acidification, sea surface temperature change and more and more intensive extreme-weather events. Sea-level rise will particularly affect tourism and fisheries sectors, often the pillars of the African SIDS. Coastal erosion will adversely affect coastal infrastructure and biodiversity. Several lowlying coral islands and sand cays would

disappear. The coastal flooding would be enhanced due to severe storms and abnormal high tides, resulting in erosion of shoreline and beaches that are critical for local populations and the tourist industry. As SIDS they are expected to be disproportionately affected by the threats of climate change (Guillotreau et al., 2012; L Nurse et al., 2014). Small island developing states (SIDS) are vulnerable to climate variability and change due to high levels of exposure to physical climate effects, economic dependence on resources that are highly affected by climate change (such as agriculture and fisheries), and poor adaptive capacity (the extent to which effects of change can be offset) (Guillotreau et al., 2012; Monnereau, Mahon, Mcconney, & Nurse, 2013; L Nurse et al., 2014; Leonard a. Nurse, 2011).

African SIDS face sea level rise (SLR), ocean acidification, thermal stress as well as expected number and intensity of storms and extreme-events (Nurse et al., 2014).

African SIDS are particularly vulnerable to sea-level rise (SLR) in comparison to other country groups (figure 1.3). Only coastal LDCs (also mostly located in Africa) show a similar level of sea level rise. SLR results in coastal inundation and habitat loss. Storm

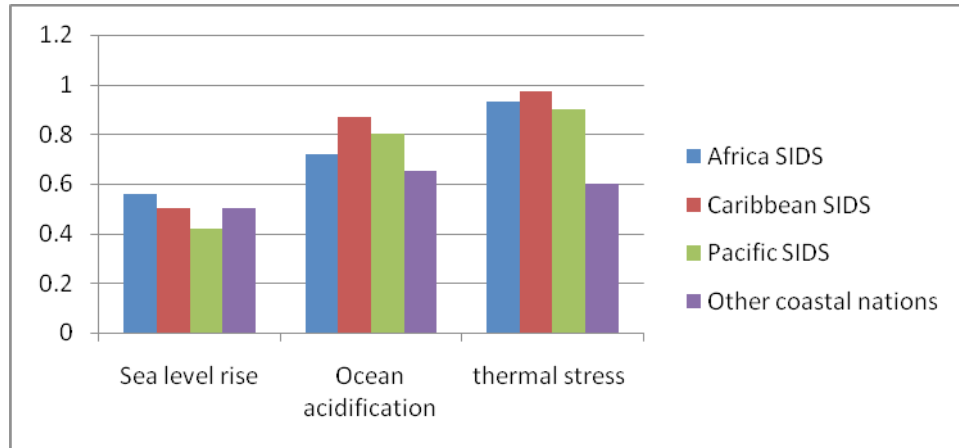
FIGURE 1.2: COMPARISON ECONOMIC CHARACTERISTICS BETWEEN THREE SIDS GROUPS AND OTHER COASTAL NATIONS



⁶ Based on annual emissions of the all nations in 2009 <http://cdiac.ornl.gov/trends/emis/top2009.tot>. calculations carried out for this report.

surges, coastal flooding can lead to death, injury,

FIGURE 1.3: CLIMATE CHANGE VULNERABILITY CHARACTERISTICS OF THREE SIDS GROUPS AND OTHER COASTAL NATIONS



ill-health or disrupted livelihoods in low-lying coastal zones. Increased storm frequency and intensity may also imply more days at sea lost to bad weather and increased risk of accidents, decrease of safety at sea for fishers (Daw, Adger, & Brown, 2009; Mahon, 2002). However, at a community level some African SIDS, such as the Seychelles and Mauritius, show comparatively high levels of adaptive capacity related to cultural values of these communities in comparison to larger countries such as Madagascar and Kenya (Cinner et al., 2012).

During the next decades cool-and-warm water coral communities are at increasing risk of being negatively affected by ocean acidification, especially as that ocean acidification will be combined with rising temperature extremes (Pörtner & Karl, 2014). Ocean acidification results in reduced growth and survival of commercially valuable shellfish and other calcifiers, e.g. reef building corals, calcareous red algae (Burkett & Suarez, 2014). Changes in ocean acidification show that African SIDS have experienced the least level of ocean acidification of the three SIDS groups and LDCs. It still experiences higher levels of ocean acidification, however, than other coastal nations. There are differences between eastern and western African SIDS. Corals in the southwestern Indian Ocean

(Comoros, Madagascar, Mauritius, Mayotte, Réunion and Rodrigues) appeared to be more resilient than those in eastern locations (Niang et al., 2014).

Coral reefs are present in eastern African SIDS but not in western African SIDS. Particularly the Seychelles has a very large coral reef. Mauritius has approximately half of the Seychelles coral reef. Coral reefs are extremely important for biodiversity, providing a home to over 25% of all marine life. They are also vital for various ecosystem services. They provide nurseries for many species of commercially important fish, protection of coastal areas from storm waves, and are a significant attraction for the tourism industry. Increasing greenhouse gas emissions cause ocean temperatures to rise, which can induce coral bleaching. One of the most visually dramatic impacts of climate change on corals has been bleaching. When the ocean warms, the oxygen content reduces, and corals become 'bleached' as a result of damages to the algae that live symbiotically with corals. Thermal stress (i.e., abnormally high ocean temperatures) can cause corals to bleach. Studies of the severe 1998 El Nino bleaching event in the tropical Indian Ocean showed reefs in the Maldives, Seychelles and Chagos Islands were among the most impacted (Cinner et al., 2012; Nurse et al., 2014). Live coral cover in the Seychelles

was reduced by 90% in the inner islands (Turner, Klaus, & Engelhardt, 2000). In Mauritius coral bleaching has become quite common in recent years. During the 1998 El Niño episode, about 50% of the corals were bleached in Mauritius Besides the coral bleaching event in 1998, some bleaching was also observed in 2002, 2005 and 2009 (ASCLME, 2012b).

This threat has added to the local pressure on many reefs over the past 10 years (Burke et al. 2011) and the rapid increase of greenhouse gases in the atmosphere present a growing threat to coral reefs in the future. The projected thermal stress in 2050 shown in figure 1.2 is based on modelled accumulated degree heating months and represents a “business-as-usual” future for Greenhouse Gas emissions (GHG).⁷ Figure 2.2 shows that thermal stress in African SIDS is high and only slightly lower than that of the Caribbean SIDS. As the Seychelles and Mauritius have already suffered extensively from coral bleaching in 1998 climate change is expected to exacerbate this.

The vulnerability of African SIDS can be considered high due to their high levels of exposure to climate change (see section above). The adaptive capacity

of the African SIDS is low and thus increased their vulnerability. However, this vulnerability is not equal across the six countries.

GDP per capita is highest in the Seychelles with an average GDP per capita of 26,200 in comparison to the lowest GDP per capita in Guinea-Bissau of 1100 USD (table 1.3). This shows the large differences between the two different SIDS groups amongst African SIDS; Mauritius and Seychelles on one side and Cape Verde, Comoros, Guinea-Bissau, and São Tomé and Príncipe on the other. There are large differences in GDP per capita with the Seychelles and Mauritius having high levels, with Cape Verde, Guinea-Bissau, the Comoros and São Tomé and Príncipe having very low GDP per capita. The latter three are also considered Least Developed Countries. Guinea-Bissau and Comoros are clearly the most dependent on agricultural production with approximately half of their GDP stemming from agriculture. Foreign Direct Investment (FDI) is highest in São Tomé and Príncipe, followed by Seychelles and Cape Verde. Official aid is also highest in São Tomé and Príncipe as it makes up nearly 1/3 of the total GDP. Cape Verde and Guinea-Bissau also have large shares of official aid (14 and 12 % respectively), followed

TABLE 1.3: ECONOMIC CHARACTERISTICS OF THE SIX AFRICAN SIDS

	GDP per capita ¹	Agriculture (%GDP) ²	Foreign Direct Investment ³	Official Aid (% GDP) ⁴	Remittances (% GDP) ⁵	Public bet (% GDP) ⁶
Cape Verde	4100	8	10	14	9	86
Comoros	1300	46	1	9	Na	na
Guinea-Bissau	1100	56	1	12	6	na
Mauritius	15,600	4	4	2	0	58
São Tomé and Príncipe	2300	14	23	30	2	76
Seychelles	26,200	2	13	2	0	68

¹ Worldbank 2012; ² Ibid.; ³ Ibid.; ⁴ Ibid.; ⁵ Ibid.; ⁶ Ibid.

⁷ The indicator used is the projected frequency (number of years per decade) that the bleaching threshold is reached at least once. The frequencies were adjusted to account for historical sea surface temperature variability.

by 9% in the Comoros. Mauritius and Seychelles receive a very small percentage of official aid (2% for both). Remittances in Cape Verde are highest with 9%, followed by Guinea-Bissau with 6%. Public debt is highest in Cape Verde, followed by São Tomé and Príncipe, Seychelles and Mauritius. Of all six countries São Tomé and Príncipe and Cape Verde thus most

depend on FDI, official aid and remittances for their economy while they face the highest public debt ratio. Cape Verde graduated from the list of least developed countries on 20 December 2007. Cape Verde's development has progress remained sound.

II. BLUE ECONOMY SECTORS IN AFRICAN SIDS

The sea and the coasts are drivers for the economy. The individual sectors of the blue economy are interdependent. They often depend on the same types of infrastructure as well as a common sustainable use of the sea. The six African SIDS are involved in various ways in the BE sectors. While for some fisheries are very important, for other blue economy sectors are more vital for the local economy such as tourism. The different levels on importance, involvement and development of each sectors in each country provides potential for other African SIDS to develop these sectors. This chapter explores the current state of affairs of each BE sector in the six African SIDS: fisheries; aquaculture; shipping and transport; tourism; marine energy (renewable and non-renewable); Pharmaceutical and cosmetic industries, genetic resources and general sea-based products; and blue carbon projects.

FISHERIES

The fisheries sector is a great provider of food security, livelihood and employment and national revenues (FAO, 2010; Kurien, 2004). Fishers and fish farmers should be the stewards of the marine environment given their dependence on their livelihood and employment on marine ecosystem services (UNEP,

2012). To develop a fishery based on 'blue economy' should focus on the overall recognition of the wider societal roles of small-scale fishers based on their influence on poverty reduction and food security (UNEP, 2012). The fisheries sector is of great importance to African SIDS for livelihood and employment, food security and foreign exchange earner yet the importance of these different aspects of the fisheries sector differs per country. In São Tomé and Príncipe, Seychelles and Mauritius the fisheries sector is important for livelihood and employment as respectively 8, 6 and 5% of the economic active population of the countries is employed directly in the fisheries sector (table 2.1). A multitude number of people are dependent on the fisheries sector in all six countries as a result of indirect employment (boat builders, traders, processors etc.) as well as household dependents. For food security fish is most important in Comoros, São Tomé and Príncipe and Seychelles.

All countries have a large small-scale fisheries sector which often involves handline fishing, hooks and sometimes seines. The fish is often processes in limited fashion onshore. However in some cases, such as in Cape Verde, small-scale fishers catch of tuna and mackerel is processed and exported in cans.

TABLE 2.1: FISHERIES SECTOR CHARACTERISTICS

	Fisherfolk ¹	Fisherfolk %Economic Active Population ²	Fish nutrition (% of daily animal protein) ³	Fish exports (*1000) USD ⁴	Fish exports % of total exports ⁵
Cape Verde	4817	2	11	14931	43
Comoros	10385	3	56	0	0
Guinea-Bissau	9800	2	4.1	3070	3
Mauritius	27469	5	17	284534	15
São Tomé and Príncipe	4520	8	46	9	0
Seychelles	2302	6	47	210200	52

1. Monnereau et al. 2013; 2. Ibid.; 3. FAO Food Balance Sheets And Fish Contribution To Protein Supply 2009; 4. FAO The relative importance of trade in fishery products in 2009; 5. FAO The relative importance of trade in fishery products in 2009

FIGURE 2.1: PRAO" CANOE WITH SAIL IN SÃO TOMÉ AND PRINCÍPE



Fish export earnings are most important in Seychelles, Cape Verde and Mauritius (52, 43 and 15% of total exports respectively). These countries are most dependent on fish exports (mostly tuna) as a source of revenue. Fish imports are also very high however in Mauritius (imports represent 83% if exports in value), Seychelles (imports represent 41% of exports), Cape Verde (imports represent 20% of exports), Guinea-Bissau (imports represent 50% if exports in value). Comoros and Sao Tome and Principe nearly only have fish imports and no exports and are thus fish importing nations.

The coastal fish biodiversity of the Comoros is low compared to other countries in the region due to the absence of a continental shelf. Deep-sea fish are most diverse and they constitute the bulk of catches in the Comoros. Small-scale fishers use destructive fishing techniques such as dynamite fishing, use of *Thephrosia Candida*, a plant poison, catching fish which requires walking on the reef flat all affect the coastal habitat. In 2011, the Government of Comoros signed an agreement for the establishment of an industrial fishing company in the country. This is intended for reaping a larger benefit of the fishery in Comoros through exports of fish products. Before this

project, in the framework of fishing agreements with the European Union (Lomé Agreements, the Cotonou Agreement), the focus was to offer support programs to fishermen to increase production and establish cold storage facilities for fish preservation. These programs set up with development aid from EU and Japan have promoted a more professional approach in the artisanal fishery (ASCLME, 2012a). The Comoros government has attempted to strengthen the small-scale fisheries sector in the country through revenues accrued from the larger industrial fishing industry. Small-scale fishermen are permitted to fish without licenses, as well as fish in protected areas, both of which are privileges that have not been granted to the industrial fishery. The two fleets, small-scale and industrial continue to target the same resource (tuna), making for potential conflicts of interest in the future. Many of the government's programs have also not been operational due to the lack of available capital and capacity, which has hindered further development in the small-scale fishery. If monitoring and surveillance to do not improve heavy exploitation of the coastal zone may also become problematic (ASCLME, 2012a). Unlike other countries in the region, tuna fishing creates no employment for Comorian nationals, as no fish caught in Comorian waters are

unloaded onshore. European ships either bring their catch directly back to Europe or unload for processing in neighboring countries with better infrastructure and handling facilities, mainly Seychelles, Mauritius, Madagascar and Kenya.

In the Seychelles the fishery is of great importance for the country; both the small-scale as well as the industrial fishery. To improve the small-scale fisheries sector is challenging however as for example, high operating and investment costs have made it difficult for the sector to meet quality standards set by the European Union which has both blocked the sector's access to the European market and also made its products less competitive in the global market. Lack of development in value-added products, poor marketing, as well as limited number of processing companies, also continue to constrain growth in the sector. Currently, the Seychelles fishery sector has three main components, namely the artisanal fishery, the semi-industrial fishery and the industrial fisheries. The industrial fishery consists of the foreign owned purse seiners and industrial long liners, whilst the artisanal fishery consists of a subset of 15 different types of fisheries (ASCLME, 2012c). The industrial fleet of the Seychelles is made up of the foreign owned purse seiners and industrial distant waters longliners operating under license agreement to operate inside of the Seychelles EEZ fishing tuna and tuna like species. The main fishing nations involved in purse-seining are from European Community (France, Spain) which take over 70 percent of the annual licenses. Seychelles registered purse seiners (French and Spanish origin) started operating in 1997. Currently there are 10 Seychelles registered purse seiners all of Spanish origin (ASCLME, 2012c).

In Mauritius the tuna fishery is split into the coastal tuna fishery and the offshore industrial tuna fishery. Tuna and tuna-like species are caught by local fishermen near the coast and mainly around Fish Aggregation Devices (FADs). Industrial tuna fishing is carried out

mainly by long-ascliners and purse-seiners. These are mostly licensed foreign fishing vessels that catch about 10,000 tonnes yearly in the EEZ of Mauritius. The species caught are mainly the skipjack tuna and yellow fin tunas (ASCLME, 2012b).

African and Indian Ocean waters are host to a number of important fish species that are caught by EU vessels as well as Asian vessels such as Japan and Taiwan. The EU has bilateral fisheries agreements with non-EU countries which entails that the EU gives financial and technical support in exchange for fishing rights.⁸ In the case of African SIDS these agreements have been made with five African SIDS, notably: Cape Verde, Comoros, Mauritius, São Tomé and Príncipe and Seychelles and Guinea-Bissau. The agreement with Guinea-Bissau came to an end in 2012. A new protocol was initiated in but its adoption procedure has been suspended sine die following the military coup in Guinea Bissau in the spring of 2012. There is currently no protocol in force and EU vessels are not allowed to fish in the EEZ of Guinea Bissau.⁹ However, in July 2014 the European Union and Guinea Bissau have agreed to revive the ratification process for a fisheries partnership agreement (FPA) between the two parties.¹⁰

All these agreements are tuna agreements with allow EU vessels to pursue migrating tuna stocks as they move along the shores of Africa and through the Indian Ocean as well as the Atlantic one. The sectoral support aims to promote sustainable fisheries development in the partner countries, by strengthening their administrative and scientific capacity through a focus on sustainable fisheries management, monitoring, control and surveillance.¹¹ However, in reality this is often not the case. The vast

8 http://ec.europa.eu/fisheries/cfp/international/agreements/index_en.htm

9 http://ec.europa.eu/fisheries/cfp/international/agreements/guinea_bissau/index_en.htm

10 <http://www.undercurrentnews.com/2014/07/17/eu-guinea-bissau-agree-to-revive-fisheries-agreement-process/>

11 http://ec.europa.eu/fisheries/cfp/international/agreements/index_en.htm

FIGURE 2.2 TUNA FISHING VESSEL IN MAURITIUS*



* <http://business.mega.mu/2012/07/30/tuna-sapmer-invest-around-rs-8-10-iillion-mauritius-eez/>

majority of EU public fishing access agreements do not mention any quotas, and at best, refer to a 'limit of reference' (which can be exceeded for an additional payment, without any links to management targets, such as MSY, or stock status). This creates a loophole that both distant-water fishing countries and host countries use to maximize either their catch or their rent, sometimes at the expense of the resource's health and consequent overexploitation of the fish stocks (LeManach et al., 2013). Although the countries make revenues as a result of the bilateral agreements with EU and other countries (the fee per tonne of tuna caught paid by ship owners is 35 Euro), the SIDS countries do not have their own industrial fleet (even if for example when they fly the flag of Seychelles they are foreign owned). The lack of a commercial fleet in the six countries decreased their ability to fully reap the benefits of the tuna stocks. Fortunately the pelagic species such as tuna are generally not heavily exploited by local fishers (LeManach et al., 2013).

However, the rewards gained by the government do not necessarily flow back to the coastal communities that are able to catch less fish because of the foreign industrial fishing. Value adding during production of

fish has been a strategy for some countries. Mauritius made deliberately the choice of making Port-Louis an hub for tuna processing, competing with Seychelles but they developed high value product processing using for instance the latest technology while Seychelles is still focused on the canning industry.

The EEZ of the countries is very extensive, their own commercial fishing fleet limited to small-scale boats while little finances are available for patrolling and surveillance large-scale Illegal, Unreported and Unregulated (IUU) fishing takes place (ASCLME, 2012a, 2012b, 2012c). Yet, the situation between Indian Ocean and Atlantic Ocean is different whereby the Indian Ocean suffers less from IUU fishing than west African fisheries. The fisheries of São Tomé and Príncipe and Guinea-Bissau suffer the most from IUU fishing with less in Cape Verde. Offshore pelagic fisheries represent some highly valuable tuna stocks and an abundance and diversity of other species that live in these waters such as demersal snappers, crustaceans and molluscs.

The Seychelles and Mauritius are actively engaged in management and research of their pelagic offshore

fisheries. There is large-scale IUU, mostly occurring in mainland East African countries' EEZ waters, which has significant implications for Seychelles and Mauritius because most of the pelagic species are highly migratory or straddling stocks. In the past, some fishing vessels have been confiscated and fined for illegal activities yet the resources required for monitoring and surveillance are high for a developing state with a small economy like Seychelles (ASCLME, 2012c)

Due to the overfishing of coastal stocks, many countries, especially those with large EEZs, plan to expand their semi-industrial and industrial national fleets to new fishing grounds in their EEZs. In addition, as part of the agreements implies that countries are paid per tonne of tuna caught the countries lose out on a lot of income as part of the tuna catch is not reported.

The effects of climate change are also anticipated to indirectly affect fisheries, as changing water temperature impact negatively on coral reefs and mangroves that function as nurseries, habitats and foraging grounds for fish. Also associated with changing weather patterns, are shifts in migratory patterns of fish species, affecting their availability during different periods of the year. These climate change impacts on fisheries potential yield are diverse throughout the oceans and no precise projections can yet be made yet it is expected to have a larger influence on demersal fisheries than on pelagics (Barange et al., 2014; Barange & Perry, 2009). Tropical and sub-tropical regions are also expected to be more severely affected by climate change than the higher latitudes (Cheung et al., 2009).

AQUACULTURE

Aquaculture is the fastest growing food-production sector and future development prospects appear promising (UNEP, 2012). Fish farming is increasing and will continue to increase and expand in the maritime

environment as the demand for food fish increases. Approximately 16.6 million people worldwide are employed in fish farming, mostly concentrated in Asia. Aquaculture, also known as fish farming, is the controlled cultivation of freshwater and saltwater animals or plants (Boto & Biasca, 2012). Aquaculture keeps on expanding and is set to remain one of the fastest growing sectors. Nigeria for example has shown a tremendous growth in aquaculture production over the past decade (FAO, 2014). African aquaculture production is almost exclusively of finfish, primarily tilapias (Boto, Phillips, & D'Andrea, 2013). Nigeria is currently the largest aquaculture producer in Sub-Saharan Africa and is the largest producer of catfish (Boto et al., 2013). The fishery developed due to private actors initiative and without government intervention (Worldfishcentre, 2012). In the African SIDS aquaculture has not been widely developed. Aquaculture can help lessen fish imports and increase employment as well as help food security and sustainable coastal aquaculture can thus reduce pressure on aquatic resources including the depletion of wild fish stocks, destruction of fish habitats and declining biodiversity. However, aquaculture has also had environmental and socio-economic impacts (Boto et al., 2013) which raises concerns. Mangroves and wetlands have been destroyed for e.g. shrimp-farming while nutrient and chemical waste are an environmental concern (Boto et al. 2013).

In Mauritius aquaculture is already booming while in other African SIDS aquaculture has not taken off yet. This paragraph will shown aquaculture is still underdeveloped in African SIDS and provides great potential to those that have no aquaculture as well as for those countries who already engage in aquaculture. These SIDS often have a local market and/or tourists sector to consume the aquaculture products; processing facilities often already available as well as local (fish) feed in Seychelles, Mauritius and Cape Verde but not for the other islands. Development potential for aquaculture development

in African SIDS can be found in : shrimp farming; fish farming in cages in bays; culture of marine aquarium fish; pearl cultivation but also in inland aquaculture opportunities such as catfish and tilapia which are already well cultivated in mainland Africa (Worldfishcentre, 2012). The potential to develop the aquaculture industry and substantially increase fish production and promote export and economic growth exists and it is believed that the technology undertaken for the various types of aquaculture need to be adapted to suit local conditions.

In Cape Verde the entire yearly consumption of at least 60 tons shrimps in Cape Verde is imported. With a growing tourist sector in Cape Verde and a worldwide trend to fulfil protein demand increasingly with seafood, a good market opportunity has arisen. A Brazilian company has joined hands with those in Cape Verde and in 2009 a joint venture to implement a shrimp farm on Sao Vicente of open ponds and expect to replace shrimp import in short term and to export the surplus production has been developed. A similar project for a tilapia fish farm is also under way involving the same Cape Verdean and Brazilian business owners. The idea is to raise the fish to serve as bait for tuna fishermen. China has also shown interest to develop a shrimp farm in Cape Verde. However, information on development of these projects is unavailable.

For the Comoros, São Tomé and Príncipe and Guinea-Bissau very little secondary literature is available on fish farming. As a result this report that at present no fish farming is being undertaken in these three countries. During a workshop on aquaculture potential in 2011 in Guinea-Bissau fishers showed a large interest in developing aquaculture. Recently in Guinea-Bissau there has been a workshop to analyze the development opportunities of aquaculture.¹² However, it was observed that mariculture practice in

¹² <http://gclme.iwlearn.org/meetings-workshops/workshops/gclme-fish-farmers-to-learn-about-mariculture-techniques>

the ocean is fraught with difficulties such as: securing fish cages amidst high ocean swells, strong and high waves and strong seasonal currents. Sustainable shellfish aquaculture in Guinea-Bissau could provide great potential. Shrimp farming in West-Africa has good potential according to the OECD as demand for shrimp is increasing while natural stocks are decreasing (OECD, 2006). However, this does require good infrastructure and processing facilities (OECD, 2006) which is also the case for Guinea-Bissau.

In Mauritius aquaculture is currently booming due to a recent change of the coastal legislation Aquaculture practices in Mauritius date back to the French colonization period. Fingerlings of multiple species of marine fishes were collected from the lagoon and stocked in 'barachois' for fattening to be used as live prey on fishing around FAD. Such type of farming is still practiced. With the support of the Food and Agriculture Organisation, financed by the European Union, 2 aquaculture projects have been implemented in Mauritius in 2014. In one of the projects fish breeding cages are build and installed at sea (within the lagoon). They have already been stocked with fingerlings of the Rabbit fish (*Siganus sutor*). The culture of the freshwater prawn is undertaken by a number of small and medium scale farmers in fresh water and seeds are provided by the Mauritian government hatchery. Another project being considered by the Ministry of Fisheries is seaweed farming as many Asian consumers consume this product. Experimental culture trials of two sea cucumber species were undertaken as well as with crab farming and oyster farming (also carried out in Seychelles). These have not yet been considered commercially viable yet it shows the wide range of interest in aquaculture in Mauritius.

In Seychelles the aquaculture sector is fairly recent. The development of the aquaculture sector started in 1989 with the construction of a 43 pilot s to grow black tiger shrimps (*Penaeus monodon*) later

FIGURE 2.3 AQUACULTURE CAGE IN MAURITIUS*



* Source: <http://mauritiusaquaculturesector.blogspot.nl/>

expanded into a full-fledged commercial integrated project following several development phases. There are a total of 200 grow-out ponds supplied by two hatcheries and the production is processed directly in a processing factory. The shrimp feed is produced at the Animal Feed factory located on Mahé. On a different scale, giant clam (*Tridacna maxima*) and pearl oyster (*Pinctada margaritifera*) farming started in 1993 and 1995 respectively. The quality of pearls produced from the black-lipped pearl oyster more than matches the quality of those obtained from the Pacific islands which are the main production centres for that type of pearls. To date, the Seychelles are the only country in the western Indian Ocean region that has a commercial pearl farm and a giant clam farm. Overall the aquaculture sector employs around 400 people, mostly by the shrimp farm and its ancillary services

SHIPPING AND TRANSPORT

Ports are critical infrastructure assets that serve as catalysts of economic growth and development. SIDS are particularly dependent on maritime trade as no other ways of transport of products are available except for air transport. Yet, imports and exports are crucial for economic development. In addition to playing a key role in international trade, they

create jobs, generate wealth and value, contribute to national GDP and promote the expansion of related and near-by industries and cities. Manufacturing, agriculture and services activities all go via the ports, and are important as both stimulate port activity through exports and international trade and strengthen the link between the Small Island State and the global economy. Thus, any increased activity in manufacturing, agriculture and trade services will not only benefit the port, but it will also be very positive for countries and coastal communities. Maritime transport handles over 80 per cent of the volume of global trade and accounts for over 70 per cent of its value. The expansion of maritime trade over the past decade is accompanied by the opportunity for some countries but also proved constraints for others. The technological developments required for the efficient management of port services and infrastructure have also encouraged the construction of increasingly larger ships. Larger ships also require larger handling ports. However, in the African SIDS the development and use of these larger ships have not always coincided with development of larger ports and harbors as this requires large-scale investments African SIDS do not have and for which they will need international support. As developing countries strive for improved infrastructure capacity, they will be confronted with increasing concentration of shipping services. Recently, the United Nations Conference on Trade and Development (UNCTAD) found that 35 coastal countries were served by only three or fewer liner companies in 2011. The consolidation of services provided by the container shipping industry to achieve improved operational efficiency may thus also have reduced negotiating powers for some players. Recently African SIDS have realized that ports are crucial to increase or develop further fishing activities (for e.g. vessel maintenance, processing, re-exports). In order to develop this sector Seychelles, Mauritius and Cape Verde are taking actions to develop their ports as even if they are not catching the fish it is profitable to

TABLE 2.2: PORT CHARACTERISTICS AND LINE SHIPPING CONNECTIVITY

	LSCI	Number ports	Size port Small	Size port Very small	Port for medium ships up to 500' (M) or large ships 1000'(L)	Coastal natural	Coastal breakwater or other
Cape Verde	4	2	1	1	1 M	1	1
Comoros	5	4		4	4 M		
Guinea-Bissau	4	2		2	1 L		1 River natural
Mauritius	25	1	1		1 M		1
São Tomé and Príncipe	7	2		2		1	1 Open roadstead
Seychelles	8	1		1		1	

have the Distant Water Fleets (DWF) make use of their port facilities.

The Liner Shipping Connectivity Index (LSCI)¹³ of the African SIDS is relatively low implying they are not well connected to global shipping networks (see table 2.2)¹⁴ LSCI on the low side as lowest is Cayman islands with 1 and highest is China with 158. Mauritius is the only country with a higher LSCI of the six countries (see table 2.2). Table 2.2 shows¹⁵ further that none of the six SIDS have a port that can be categorized as medium or large on a global scale. They only have small to very small ports. Only one port can handle ships up to 1000 meters (Guinea-Bissau) whereby the port is located in the river rather than on the coast. However, in reality the port cannot accommodate any medium and large vessel as it is full of wrecks. In order for the port to function properly these wrecks have to be cleared. The remaining ports are nearly all located on the coast and either natural coastal ports (a coastal harbor sheltered from the wind and sea by virtue of its location within a natural coastal indentation or in the protective lee of an island, cape, reef or other natural barrier) or coastal harbor (a coastal harbor

¹³ Worldbank 2012

¹⁴ It is computed by the United Nations Conference on Trade and Development based on five components of the maritime transport sector: number of ships, their container-carrying capacity; maximum vessels size, number of companies, number of services, and number of companies that deploy container ships in a country's port.

¹⁵ Based on World Port Index 2014

lying behind a man-made breakwater constructed to provide shelter). These ports can thus be vulnerable to climate change impacts such as increased frequency and intensity of storms and sea-level rise.

In order to increase economic activities the current maritime services need to be improved. Comoros, Mauritius and Seychelles have all committed themselves to a Regional Monitoring Committee (RMC) to set up a new Regional Maritime Service (RMS). This will contribute to the connectivity of regional markets, facilitating trade, the movement of people, and the promotion of inclusive and equitable growth.

Cape Verde has two ports according to the World Ports Index (Mindelo and Praia). The infrastructures of Mindelo and Praia have the characteristics of deep-water ports and have processing facilities and storage container traffic. These facilities help ensure not only the integration of the Archipelago into the world but also serve towards the distribution of goods to other islands. The country's geographical location at the crossroads of international shipping lines, is favorable to the development of a "hub" function, more at a regional level than international level. However, a major obstacle is the lack of transport between the different islands. The development of deep-sea port in Mindelo could further increase economic interactions

of islands among themselves and between them and the mainland. Mindelo is used as for tuna and shark long-liner fishery by DWF which increases economic profits of the ports.

Comoros has 4 ports which are all classified as very small by the world port index. Nevertheless, all four can handle medium sized vessels. Moroni (Grande Comores) port handles an estimated 80% of the country's business volumes. Larger vessels need to anchor out of the port and transfer the load to barges that are towed to the port as the draft is limited. Only vessels provided with own crane can download containers onto the barge in Moroni port. Limited handling equipment, which does not allow a high rate of loading and offloading vessels. Recent investments in Moroni port are improving the cargo handling capacity (Boloré's investment, see the 2011 10 years agreement); further development in the quay are expected. The deeper draft of the second port Musamudu (Anjouan Island) enables this port to recently act as a redistribution centre for other ports. Comoros are very important in being an oil hub. Over 30% of the world's oil production passes through the Comoros, representing more than 5 000 tanker trips per year (ASCLME, 2012a). Marine pollution from accidents at sea such as the Taurus boat that caught fire in March 2007 near the port of Moroni with 60 tonnes of diesel on board, the emptying of ships ballast water at sea, accidental oil spills during the transshipment of oil products in ports and oil depots all affect the environment. The accident risk increases during the cyclone season. This impacts the sustainability of the Comoros fragile environment (ASCLME, 2012a). Transportation between the islands is poor, especially during the rainy season when it suffers from irregularities (ASCLME, 2012a).

The two ports of Guinea-Bissau are all located on the river. The Port of Bissau plays a crucial role in the Guinea-Bissau economy as it carries 80% of the country's international trade transactions. However,

the port has performed very poorly and faces steep competition from other ports in neighboring countries such as Senegal and Guinea. Poor performance of the port represents one of the biggest constraints, along with energy deficiencies, for the improvement of the country's competitiveness on the international arena. For instance, a lack of adequate port facilities has hindered the efforts of Guinea-Bissau to improve the competitiveness of its cashew crops, the main export product of the country, even though their cashews are considered among the best in the world. Options for building a second port in the country or to use ports in neighboring countries have been considered in the past, but until now, the Port of Bissau continues to be the main existing port in the country. In 2010 the government of Guinea-Bissau requested a study to be undertaken to examine the costs of improving the port. The report states that four phases of port development are necessary. The first phase of the project that came out of this study has been carried out while for the second phase the government is in negotiation with the West African Bank for Development.

Mauritius has one port but is very well connected in the LSCI. Port Louis harbor is strategically located between Africa, Europe and Asia. It handles 99% of the Mauritian external trade and acts as an engine for growth in the process. Over the past two decades the port has seen many investments in modern infrastructure and container facilities, supporting seafood exports, Freeport services, logistics, transshipments, and cruise-ship tourism (ASCLME, 2012b). The Mauritius Freeport Authority (MFA) is a duty-free logistics, distribution and marketing hub for the region. Port Louis is Africa's second largest financial centre, and as the country is politically and financially stable, all strengths which are highly conducive to private-sector confidence. The government's promotion of economic development has been highly positive, which should be very beneficial for port activity. There are also new

opportunities in the sector, particularly for port expansion, as well as increased investments in well-designed tourist facilities, coastal property and manufacturing (ASCLME, 2012b). The Mauritius Port's Authority has launched a two phase port infrastructure development program which is to be completed in 2016. It includes a quay extension, container terminal extension and a deeper draft. The quay extension and dredging to accommodate vessels with drafts up to 18 m Port Louis will be able to receive larger petroleum, vessels, as well as larger cruise-ships. Port of Mauritius is also used by purse-seiners and long-liner fish for high value fish products. However, there are also constraints: high transport costs, cyclone activity, climate change and the presence of pirates from Somalia in the West Indian Ocean, already have negatively impacts the shipping sector. There is also increasing competition in manufacturing, particularly from Asia, which could be a potential threat to economic development in Port Louis (ASCLME, 2012b).

São Tomé and Príncipe has two very small ports. A French large container cargo company signed an agreement in 2009 with the São Tomé and Príncipe government to build a deepwater port in the Fernão Dias area. The work, estimated at US\$500 million, should have begun in 2009 but has been continually postponed due to the inability of the French company to obtain sufficient funding. São Tomé and Príncipe has, for several years, been seeking outside assistance for such construction as a result; there were abortive negotiations with other countries, including Russia. Currently China intends to build a massive deep-water port in São Tomé, which will make exporting oil easier and generally facilitate sea-borne commerce. The main port currently has a shallow draft and as a result can only accommodate small vessels. Large ships have to anchor over a mile offshore where cargo is unloaded onto small vessels. The new port will be able to handle containers and is being built at Fernao Dias, 10 km north of Sao Tome city.

Port Victoria in Seychelles is a modern deep water port which has been specifically planned for mechanized handling of cargo. Today's Port Victoria has berthing facilities for all major vessel types including cargo and container ships, tankers, naval vessels, large fishing ships (e.g. tuna purse seiners) and smaller local fishing vessels, recreational yachts and launches, and inter-island ferries. Port Victoria is relatively limited in throughput. The port is however, the central point of economic activity in the country, being vital for the fishery and the country's bulk imports, particularly fuel, the most important general cargo sector. As the fishery demands processing and transshipment facilities, fuel supplies and other associated commodities it is also a large component of port activity(ASCLME, 2012c). The longest wharf (New Port Wharf) is 370 m long and can service ships up to 210 m in length. Port Victoria has a range of large storage sheds for cargo, an industrial dock yard and slipway and a tuna processing plant adjacent to the main tuna vessel wharf that services purse seine vessels of up to 160 m in length. Port Victoria is a busy international shipping port and the major hub for the Western Indian Ocean tuna fishery. In 2003, Port Victoria handled 88 % of the 450 000 tonnes of tuna caught by purse seiners in the Western Indian Ocean (SFA, 2003). Port Victoria has been affected by pollution from industrial activities including effluents from the tuna canning factory and the loading, unloading and transshipment of goods (ASCLME, 2012c). The Saint Anne Marine National Park is an important area for the tourism industry. Its proximity to the Port Victoria means that the park can potentially be affected by the pollutants from the port area (ASCLME, 2012c)

TOURISM

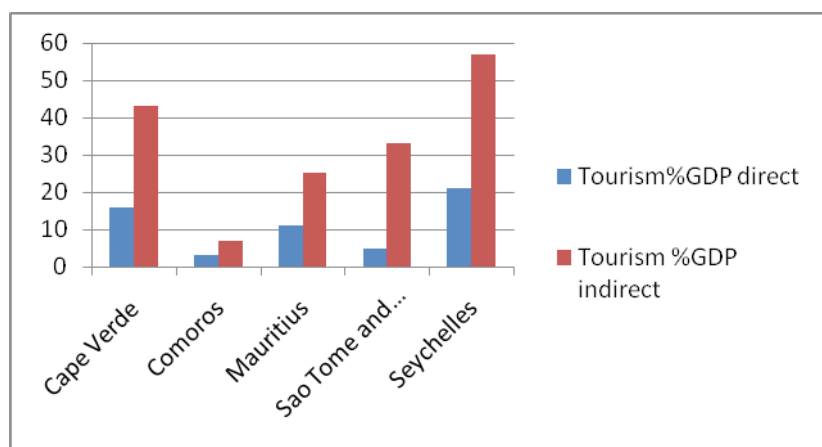
Coastal tourism is the largest market segment (UNEP, 2012) providing great opportunities for SIDS. SIDS are often endowed with a pristine environment, unique ecosystems and cultural features that naturally differentiate them from other tourism destinations. Seychelles and Mauritius for example

have very extensive and pristine coral reefs. In the Comoros on the other hand the historical, religious and cultural sites are very rich and varied. They reflect the population of the islands by successive waves of immigrants from a variety of regions such as Africa (Bantu), the Persian Gulf (Arab and Shirazi), Europe and Madagascar (ASCLME, 2012a). Cultural sites include religious sites, tombs, fortifications and buildings associated with the sultanates. Tourism is an important sector for the African SID except perhaps for Comoros and Guinea Bissau where the tourist sector is much less developed. In both countries it was developed but collapsed (in Comoros after the series of coups and the islamisation of the country and in GB after the civil war in the late 90s.). Tourism has contributed much to the development of these four SIDS and, as one of only a few development strategies currently being employed, will continue to be very important for their future growth. It could also stimulate the development of other sectors. The African SIDS have new tourism development potential. Besides promoting regular dive tourism, maritime archeology is a niche that could be developed in several SIDS. Due to its location Mauritius for example has a rich maritime history yes but deep waters all around the island. Extensive search with latest

equipment using divers, robots, and underwater instruments may be made and it can boost education and diving tourism. Cape Verde also has over a 100 shipwrecks that were found and shipwrecks were also found in the Seychelles. In this regards heritage tourism is also a road for development yet it is a niche market. The economic downturn over the past years has affected the industry in several African SIDS such as Mauritius. Further tourism development should include attention for the pressures tourism creates. Coastal tourism pressures include water pollution and consumption, waste, land conversion, pressure on biodiversity, survival of local and indigenous cultures (UNEP, 2012). In order to develop the tourist industry in a sustainable manner environmental externalities of the sector should be taken into account but also the profits of the local population. The share of spending in the local economy determines local effects of tourism and is therefore crucial. Increasing involvement of local communities can lead to poverty reduction. Energy and water consumption need to managed effectively in the African SIDS.

Tourism contributes directly and indirectly to the economy of the five African SIDS (figure 1.4). Particularly Cape Verde and Seychelles are very

FIGURE 1.4 DIRECT AND INDIRECT CONTRIBUTION OF TOURIST INDUSTRY TO GDP*



Source: <http://www.wttc.org/research/economic-impact-research/country-reports/>

* Data on Guinea-Bissau was unavailable

dependent on the tourist industry with indirect contribution as high as 43% in Cape Verde and 57% in Seychelles.

In Cape Verde the tourism industry is a very important economic sector as we have seen above. With 10 islands strategically positioned between South America, West Africa and Europe, offers a diverse array of distinct landscapes, nature, beaches. The tourist industry has become an important engine of growth in the Cabo Verdean economy after 2005 why?. However, with the economic downturn in 2008 the tourist industry has become affected and slowed the economic growth in this sector. However, tourism neither significantly contributed to job creation nor substantially supported the expansion of others sectors, except construction (12% of the GDP) as most all-inclusive resorts and real estate are foreign owned. Although one primary goal of the Cape Verdean government is to ensure that tourism keeps within the margins of its fragile ecosystems and that economic growth spreads to the poorest sectors of the population this also proves to be a challenge in reality. Cape Verde is also looking into cruise tourism to diversify its tourism industry. In 2011 the first cruise operators came to the island for inspection. that are complemented with its rich culture, history, music and warmth of the people. The islands are all different and can thus offer something different to the cruising industry. From 2012 the number of cruiseships stopping in Cape Verde has increased. In general the number of calls in 2011/12 has been increasing and for 2013/14 it is expected an increase of 50% in Praia and 25% in Mindelo.

Comoros does not have as strong a tourist industry as other small island in the vicinity such as Réunion, Mauritius, and Seychelles. Its weak tourist industry is mainly because of its insecure political climate, with many political upheavals over the past three decades. The greatest constraints in the sector

is lack in capacity. Limited accommodation capacity, banking facilities

and transport have all been highlighted as weaknesses in the sector, while political instability and a lack of disposable capital at the community level continue to constrict growth(ASCLME, 2012a). There have been initiatives by both the public and private sectors in the tourism industry, but to date, a lack of commitment from both sectors and external circumstances have prevented further growth of the tourist sector. As the sector is undeveloped this also provides a great opportunity for sustainable development of the tourist sector from the onset of the development of the sector.

The tourist industry in Guinea-Bissau is limited today but there was eco-tourist development in the 70s and 80s. Instability over the past years has had a negative effect on the tourism frequentation Frequent coups, a civil war and general unrest over the past decades have prevented the country from increasing tourism activities and establish effective economic and legal conditions to boost the private sector. The government is committed to an orderly development and expansion of the sector to include cultural and eco-tourism in order to maximize the benefits from tourism however this is difficult in reality. The government has identified tourism as one of the most potential economic activities and is willing to promote and develop the sector. However, tourist confidence as well as that of foreign investors is low and it requires large-scale investments. Off Guinea-Bissau's coast lie the magnificent Bijagós Islands, an archipelago of about 20 tropical islands. Although there are some facilities on the islands catering for tourists, their potential for eco-tourism is used. However, this has also lead to conflicts with local populations such as fishers and other user groups (IBAP, 2006).

Tourism contributes significantly to economic growth in Mauritius and has been a key factor in the

overall development of Mauritius. Tourism is thus a strong sector in the Mauritius economy, and has grown at a rate of 9% annually between 1985 and 2005 (ASCLME, 2012b). Mauritius is predominantly a holiday destination for high-end beach-resort tourists. The sector has suffered from the economic downturn as less tourists visited Mauritius (ASCLME, 2012b). Numerous environmental issues have also been raised around the sector, including coastal erosion and coral reef depletion, both of which threaten the very natural base that drives the sector. Poorly regulated land development and inadequate wastewater management have also been highlighted as significant environmental issues in the sector. The National Tourism Policy emphasizes low impact, high spending tourism. Selective, up-market, quality tourism is favored, and although such tourism is not the only type, it constitutes the major segment of our tourists who stay in high class hotels. It can be claimed that as tourism is mostly located in all-inclusive resorts benefits do not trickle through. Nevertheless, it does provide foreign exchange and local employment. Having tourists reside in particular spots also places less burden on the fragile environment. Recently the economic downturn has affected the tourist industry on Mauritius as most visitors come from Europe (ASCLME, 2012b). The government has also announced plans to both reduce the sector's dependence on the European market by tapping into markets in China and India, as well as professionally empower local communities to participate in the sector (ASCLME, 2012b). One new development for Mauritius could be the development of maritime archeology. Many tourists enjoy the ocean and although there are shipwrecks that have potential for sustainable tourism and resources in SIDS, they have not been researched or protected for tourist development. Sport fishing is an important tourist attraction in Mauritius. The total catch of this fishery is estimated at 400 tons per year and consist mainly of bill-fishes and tunas. Sharks are also caught by sport fishermen (ASCLME, 2012b). This also burdens

the fishery resource nonetheless and can lead to overexploitation. Careful development of this sector is therefore important.

São Tomé and Príncipe does not have a full-fledged tourist sector. Yet, 33% of its GDP is indirectly related to tourism. Tourism developed only since the 1990s and initially led to private investors. Starting in early 2011, the Sao Tome and Principe government worked with the World Bank Group to abolish a colonial licensing system which held private enterprises in tourism back. This change particularly affected the tourist industry on the island. Especially small-scale and medium sized businesses were facilitated to enter the tourist sector. In 2011, the number of business registrations more than quadrupled from the previous year to 241. In 2012, this number increased by another 61 percent to 388. The environmental impacts of tourism on the islands can be severe. The reform is part of a medium-term tourism development strategy to build capacity within the tourism administration. As reforms continue, the country is expected to attract more entrepreneurs and tourists. Now it will be much better positioned to respond to growing demand and interest. Sao Tome's delicate and small number of ecosystems should be a serious consideration in developers plans to bring tourists to the country. Currently, the lack of cultural importance placed on the environment combined with the lack of institutional capacity to address environmental issues place them as last priority.

Seychelles has a very large tourist industry and 57% of GDP is indirectly related to this sector. Most tourism is high end tourism with a focus on luxury sun vacations. Although there is an increasing interest in ecotourism and other forms of tourism, the focus, even in marketing, is still on beach tourism. Yachting activities are very important. The yachting and cruising sector employs a minimum of 100 people and requires, inter alia, fuel, food, landing and docking fees, maintenance and repair services, harbor fees etc. Nevertheless,

piracy is a major issue affecting the yachting sector in the Seychelles.

MARINE (BLUE) ENERGY (FOSSIL AND RENEWABLE)

SIDS are highly dependent on fossil fuels, and the majority spends in excess of 30 percent of their foreign exchange earnings, annually. Paradoxically, the vast renewable energy resources of SIDS remain undeveloped. Islands around the world are working on renewable energy and energy efficiency projects to increase self-sufficiency in the energy sector. For SIDS, converting renewable energy resources into economic benefits face a number of hurdles including limited availability of financial resources, institutional barriers including human capacity, and access to technology. Development of a sustainable energy sector in SIDS will, in addition to improving energy security and promoting economic growth, also bring about reductions in Greenhouse Gas (GHG) emissions. Non-renewable resource extraction can also provide a potential pathway to decrease dependency on imported fossil fuels. Imports of fossil fuels now often take up a very large portion of foreign exchange. Marine-based renewable energy such as wind, wave and tidal range and currents offers a significant potential to contribute to low-carbon energy and reduce dependency on imports of expensive fossil fuels. Development of each however is closely connected to environmental conditions as well as the human, technical and financial capacity for development. They can also provide alternative employment opportunities as renewable energy is highly labor intensive (UNEP, 2012). However, marine-based renewable energy is not yet cost-effective; only offshore wind is close to being cost competitive with fossil fuels and nuclear sources (UNEP, 2012). There are thus large-scale challenges that need to be overcome for large-scale commercialization of marine-based renewable energy technologies such as high capital costs and the logistics around storage and transportation which is particularly crucial for remote

SIDS. Offshore wind and to a lesser extent tidal range technologies have been developed but mostly in Europe (UNEP, 2012) and thus none so far have been developed in other SIDS of more particularly in African SIDS. Oil and gas exploration has been carried out in all six African SIDS and for some such as Guinea-Bissau it holds great potential. For others such as Cape Verde and São Tomé and Príncipe despite decades of exploration not commercially viable petroleum fields have been found. Offshore drilling operations have various environmental impacts on marine and other wildlife. These include drilling muds (dumping of drilling fluid, metals (incl toxic metals) into the ocean), brine wastes, deck runoff water and flowline and pipeline leaks but also more catastrophic spills and blowouts are also a threat from offshore drilling operations. These operations also pose a threat to human health, especially to oil platform workers themselves. Whenever oil is recovered from the ocean floor, other chemicals and toxic substances come up too that are often released back into the ocean. In addition, seismic waves used to locate oil can harm sea mammals and disorient whales.

NON-RENEWABLE OIL AND GAS RESOURCES:

As terrestrial, near-shore, and shallow water reserves are generally plateauing and declining, offshore hydrocarbon development in deeper waters, as well as further offshore and in more hostile environments, has become more significant. This trend is underpinned and reinforced by escalating demand and thus elevated oil prices. According to the U.S. Energy Information Administration the six African SIDS do currently not produce any natural gas or oil. They thus depend fully on exports for these products. As oil has been found in the EEZ of neighboring states of some of the country's, over the past decade oil and gas exploration has gained interest in the six countries. However, in none of the six African SIDS exploration has been successful to the extent the oil can be commercially extracted. In the three African SIDS on

the west coast of Africa exploration has shown mixed results.

Cape Verde has been discussing oil exploration with Brazil's Petrobras, a world leader in deep and ultra-deep oil exploration and production. Petroleo Brasileiro S.A. (Petrobrás) of Brazil and the Government of Cape Verde have signed an exploration accord for the exploration of petroleum offshore Cape Verde. The accord was a part of a package of measures that included an interdisciplinary study for research of Cape Verde's marine resources. The Government stated that the accord would help the country develop its resources, including natural gas and petroleum (Energia.gr, 2010). The exploration has not yet shown results however.

In Guinea-Bissau there have been irregular initiatives to explore offshore oil reserves and a number of international companies have been involved in offshore exploration during the last 40 years. Amongst them number Esso, Elf, Pecten, Lasmo, Sipetrol of Chile, West Oil, Sterling Energy, Benton Oil and Gas and Petrobank Energy and Resources. Offshore exploration has been hindered by a boundary dispute with Senegal, which was not resolved until 1993. Under an agreement signed in 1995, the area of the border dispute with Senegal, is now jointly managed by both Senegal and Guinea-Bissau. Under the terms of the agreement, the proceeds from activity in the joint exploration area are divided between Senegal and Guinea-Bissau in an 85:15 ratio. Over the past years exploration of the oil reserves of Guinea-Bissau have taken place and in the beginning of 2014 a study by an independent oil and gas explorer revealed that the geotechnical studies showed significant hydrocarbon resource potential. With the permits being located in benign shallow waters, the costs of exploration and development are commercially attractive. The chance of exploration success in the first well in the permits, planned for late 2014, is thus

considered to be high.¹⁶ However, exploration wells are carried out in the sensitive border area between Senegal and Guinea-Bissau which could lead to loss of marine biodiversity.

Oil and gas have been found elsewhere in and around the Gulf of Guinea, especially in Nigeria and Equatorial Guinea. There is every geological reason to assume that the territorial waters of both São Tomé and Príncipe thus also hold exploitable reserves of oil and gas. The state signed the first oil exploration agreement with a foreign company in 1997 however, initially a dispute between Nigeria and São Tomé and Príncipe halted exploration. The dispute over whether all of the relevant waters are Nigerian or belong to São Tomé and Príncipe has been settled by sharing whatever is discovered and several concerns have begun drilling. In 2005 the blocks exploration permits were awarded and exploration began. The results however have not been successful. In 2012 several companies abandoned three blocks and in 2013 the French oil company Total abandoned Block 1 in the São Tomé and Príncipe –Nigeria Joint Development Zone (JDZ). The reason behind abandoning the blocks are equal for all companies: the disappointing results for exploration as a result of limited hydrocarbon reserves do not justify further investment.

The Comoros granted its first license for exploration and production of oil in 2012 to a Kenya-based exploration company, Bahari Resources Ltd. Hopes are high as the area to be explored is an area adjacent to a number of offshore areas of Mozambique where two oil and gas companies have made new hydrocarbon discoveries. In 2014 Comoros has awarded oil and gas exploration licenses to two companies to search for petroleum in an additional number offshore blocks which are adjacent to the highly prospective offshore Mozambique hydrocarbon areas.

¹⁶ <http://www.offshoreenergytoday.com/billion-barrel-oil-potential-in-fars-offshore-guinea-bissau-blocks/>

The oil potential of Seychelles continues to be promoted. Exploration already began in 1969 but no reserves were found (ASCLME, 2012c). Despite active exploration through 1995 no commercial petroleum resources had been discovered. Another active oil exploration activity took place in 1995, but with no discovery of commercially important petroleum products. However, tar balls from subsurface seeps have been observed in some of beaches around Mahé and Coetivy Island (ASCLME, 2012c). In late 2008, Avana Petroleum Ltd. Of Madagascar and East Africa Exploration Ltd. Of the United Arab Emirates signed a production agreement with the Government to explore for petroleum offshore Seychelles in 2009. The companies selected 15,000 square kilometers in three tranches that they believed included a series of high-potential drilling targets. In June 2013 invited oil and gas exploration companies to bid for exploration oil blocks after its two year moratorium lapsed. This exploration freeze gave Seychelles time to review its energy sector's legislation and consult with the industry. The government of Seychelles is keen on encouraging foreign oil companies to invest in hydrocarbon exploration surveys through the Petroleum Mining Act of 1976. Permission to participate in such activity must be sought prior to commencement (Seychelles Investment Bureau 2009). Minerals found in Seychelles are not strongly mineralized and have low mineralization potential, though there may be significant mineral deposits (ASCLME, 2012c).¹⁷ The country also wishes to protect its environment during oil exploration and production. With tourism making up a vital component of the economy, the country is putting strong protection measures in place, from regulating drilling to how

¹⁷ Aware of the quest that has swept across the western Indian Ocean region in the last five years, Seychelles decided to start with the policy framework before allowing prospective oil companies access to oil and gas blocks. The Seychelles signed the Extractive Industries Transparency Initiative (EITI) because it considered it was better that oil companies know what they will be required to do upfront. The country has set about preparing a strong legal framework and meeting top international standards with transparency as a key issue. The EITI requires oil companies to declare how much tax they pay and that the government in turn also has to declare how much tax it receives.

operations are conducted, including compulsory environmental impact assessments before drilling. These regulations can however also give Seychelles a disadvantage as some companies can turn to other places where rules are less stringent.

In the EEZ of Mauritius some oil drilling has taken place however no commercial viable oil resources have yet been found. India's Oil and Natural Gas Corporation has shown the most interest in oil and gas exploration in Mauritius. Seychelles and Mauritius plan to jointly explore for petroleum in an area in the Indian Ocean that they own in common. The two island nations received permission in 2012 from the United Nations for an extended continental shelf off their respective coast. The granting of the joint exploration rights was meant to forestall any future maritime territorial disputes. Mauritius is trying to adopt a cautious approach. Their aim is also to find a fine balance between exploration, exploitation of petroleum products and sustainability of the industry and environment. Environmental protection therefore is also of great importance to Mauritius as the island also greatly depends on the tourist industry. Mauritius and Seychelles have also established an Environmental Code of Practice. Both countries thus show a great awareness of the pitfalls other countries have endured after oil was discovered and indicates the countries do not wish to put the exploitation of the hydrocarbon into a 'resource curse'. The 'resource curse' refers to the paradox that countries and regions that are abundant in natural resources, most notably non-renewable resources such as minerals and fuels, tend to have less economic growth and worse development outcomes than countries with fewer natural resources.

Technological revolutions in vessel-and offshore-infrastructure design are providing solutions such as floating liquid natural gas (FLNG) unit that can produce and liquefy millions of tons per year of once-stranded natural gas supplies in the Indian Ocean.

However, the Prelude (Shell biggest ship) is currently not expected to start producing until 2017. It will start operating in the waters to the west of Australia. Shell is planning to build more FLNG barges that could be of potential interest to those countries with gasfields in the Indian Ocean and East Africa. However, the time for actual operation of these new vessels that still have to be built remains unclear and depends on the success of the Prelude and the potential for African SIDS thus remains to be seen.

OTHER NON-RENEWABLE RESOURCES:

Oil and gas reserves do not constitute the only minerals that can be extracted from the seabed. The sea floor has long been the source of valuable resources such as diamonds and both precious and base metals (such as gold and tin) from placer deposits in marine sediments and materials such as aggregates for building construction and land reclamation that should be in the introduction. These developments have taken place mostly in the near shore areas. However, oceans are considered as a 'warehouse' for minerals, amongst others, polymetallic nodules (Ferromanganese nodules), phosphorites, hydrothermal sulphides, placer deposits and sand. These include seafloor massive sulphide (SMS) deposits, ferromanganese nodules and crusts, cobalt-rich crusts and phosphates as well as the polymetallic nodules mentioned above. Such deposits also have the potential to contain rare earth elements, something that is likely to enhance their attractiveness as targets for seabed resource development. Seabed minerals are thus being looked upon as the alternative source for metals in the future, especially in the view of the depleting land resources and increasing industrial demands (Sharma, 2010). These minerals are associated with different topographic features, ranging from the placer minerals along the coasts, phosphorites on the shelf, cobalt crusts on the seamounts, sulphides on the mid-oceanic ridges and polymetallic nodules on the deep abyssal seafloor (Sharma, 2010). The advancements made

in technology have enabled great access to these resources and is thus becoming increasingly more possible.¹⁸ Deep sea mining is appealing to many countries, including SIDS, as a means of economic development and revenue generation.¹⁹ The six African SIDS can have different minerals across the different ocean habitats in their EEZ yet so far none show commercial prospects. As the six African SIDS need to enhance their energy production and depend less on fossil fuel imports other non-renewable minerals as seen as a potential new pathway for economic development. The exploration of seabed mineral availability has only seriously taken place in Mauritius and Seychelles which has not resulted in commercially viable production. In the Indian Ocean Polymetallic nodules and polymetallic massive sulphides are the two mineral resources of primary interest to developers in the Indian Ocean. The minerals for which economic assessments have been carried out in Mauritius and Seychelles are the coastal placer minerals that lie within the EEZ of different countries, and the polymetallic nodules that generally occur in the 'area' outside EEZ of any country and are regulated under the UN Law of the Sea. In 1987 there was a large-scale survey around Seychelles islands, and in 1987 in Mauritius. Polymetallic nodules were known to occur on the ocean bottom near the Amirantes Islands. Limited sampling was done in the mid-1980's, but funds for further planned work were not available. In Mauritius potentially important are the polymetallic nodules that occur on the ocean floor at about 4,000 m depth around Mauritius. They contain more than 15% of both iron and manganese and more than 0.35% cobalt. However, in Mauritius the contents of manganese nodules do not warrant extensive mining as it is not perceived to be commercially viable. According to Africa minerals book 2010 REF there was no manganese production in Mauritius

¹⁸ http://na.unep.net/geas/getUNEPPageWithArticleIDScript.php?article_id=112

¹⁹ http://na.unep.net/geas/getUNEPPageWithArticleIDScript.php?article_id=112

and Seychelles were not even included in the book. There are indications there is extensive granite below Mauritius that may contain hydrocarbon. However, this is located very deep and investigating and extracting will thus be very expensive. As terrestrial minerals become depleted and prices rise, the search for new sources of supply is turning to the sea floor there are also international concerns regarding the environmental impacts of seabed mining. Seabed mining may, for example, have detrimental effects on fish resources vital to coastal communities. The waste released may contain sediment and heavy metals. Whales and other marine life might be affected by the noise. Large robots will cut and collect material removing part of the ocean habitat. There are nevertheless different types of deep sea mineral deposits, each with different biological environments, and the extraction techniques and as a result their environmental consequences will vary between types. It is therefore difficult to predict impacts without knowing the specific details of a specific site or method of extraction. Impacts on the environment include noise pollution, fluid leaks by ships and discharges from vessels and equipment. Introduction of light on the ocean floor where there is normally no light is another factor as this can impact fisheries and other marine life. It also impact the water column, change the composition of ocean nutrients and impact marine life that reside on sea floor.²⁰

RENEWABLE BLUE ENERGY

SIDS are highly dependent on imported oil and other fossil fuels for transport and electricity generation and this is a major source of economic vulnerability for SIDS. This leaves SIDS highly exposed to oil-price volatility. It is extremely important therefore that SIDS engage further in renewable energy development. There are many commercially feasible options in many small island states for providing energy such as wind, solar, geothermal,

and oceans energy. Some African SIDS have shown their commitment to increasing the share of renewable energy at the recent 2012 conference in Barbados on "*Achieving Sustainable Energy for All in Small Island Developing States*". At this conference Mauritius committed to increasing the share of renewable energy – including solar power, wind energy, hydroelectric power, and biogas– to 35 percent or more by 2025; and Seychelles committed to produce 15 percent of energy supply from renewable energy by 2030. The Government of Cape Verde established a target goal in 2008 of achieving 50% of its electricity from renewable sources by the year 2020.

Marine based renewable energy can come from a number of sources and includes wind, solar and ocean energy. It can increase the reliability of electricity production in SIDS while reducing the overall cost to the consumer. From a macro-economic perspective generating energy from renewable energy saves SIDS from all-too-rapid use of their foreign exchange resources to pay for energy imports, which in view of the rise in energy prices on world markets constitutes a considerable additional burden on their economies. At the same time, diversifying national energy sources usually enhances the security of supply. In the long term, reducing energy generation from fossil sources will make a positive contribution to climate protection and improve local air quality. The local market will also gain new impetus for growth, as well as many new jobs in the fields of maintenance, repair and controlling. This report focusses on: wind energy; tidal energy; and energy derived from marine microbial fuel cells as these offer the largest potential for African SIDS. However, construction of some of these types of technologies will have environmental consequences (UNEP, 2012).

WIND ENERGY

The wind energy potential in many African SIDS is substantial. In comparison to fossil-fuelled power stations wind energy can now be cost-effective

²⁰ http://na.unep.net/geas/getUNEPPageWithArticleIDScript.php?article_id=112

in many places. None of the six African SIDS have offshore wind turbines. All wind turbines have been built on land, often (outer) islands. This indicates that there is no scarcity of land yet to install wind turbines and there have been no space limitations for terrestrial wind farms. Installation of wind turbines offshore is much more costly and while wind turbines still can be built on land this will be more cost effective. Nevertheless, once space becomes more limited as a country wants to reap more energy from wind energy offshore wind farms can provide a solution. In addition, for some SIDS such as São Tomé and Príncipe and Comoros which suffer from low wind speeds and thus low wind farm potential perhaps offshore wind energy might provide potential as offshore wind can be stronger and thus more beneficial. It is also easier to install larger turbines offshore in comparison to on land. Nevertheless, technical challenges are large and offshore turbines are approximately 50% more expensive to install. In addition, one needs shallow coastal waters as offshore turbines currently have a limited 20 m water depth.

Cape Verde is one of the 15 countries with the best wind resource in Africa. Cape Verde is the site of Africa's largest wind power project, which started up in autumn 2011. The islands of Cape Verde lie across the trade winds belt, as a result the archipelago has consistent wind speeds of up to 10m/s creating one of the best locations in the world for power generation. Generating equipment on four of the islands will produce a greater proportion of electricity from wind than anywhere else in the world. The aim is for the windfarm to provide 25% of the islands energy. The construction of the Cabeolica wind farm means that Cape Verde will benefit from the Clean Development Mechanism (CDM). CDM is a provision of the Kyoto Protocol that governs project-level carbon credit transactions between developed and developing countries and could lead to further Certified Emission Reduction (CER) projects in the country. There is

also an interest in small scale wind projects for small electrical grids in remote locations.

In Comoros offshore wind energy has been less successful as a result low wind potential. In 1985, two wind turbines were installed on land to drive groundwater pumps. However, neither has provided the amounts of water initially estimated. A wind generator requires average annual wind speeds of at least 3 m/s, and data has shown that the island winds do not always reach this speed. It is believed the Comoros would benefit more from solar energy, geothermal energy and hydropower installations.

In Guinea-Bissau only a small proportion of the population has access to public electricity, primarily in the capital Bissau and often only part of the time still no public electricity. The country's entire public power system is operating on a generation capacity of 25% of what it had been before the 1998-99 internal conflict and equivalent to the capacity needed to supply less than 2000 people in the US. The country is completely dependent on petroleum products, despite its own high energy potential, especially in terms of hydroelectric power. The average wind speed is estimated at 2.5 to 7 m/s along the coast and on some of the islands and is thus very promising potential. In 2012 China donated 150 million USD to develop wind farms in Guinea-Bissau.

Mauritius aims is to source 35% of its electricity from renewables by 2025, with wind supplying 8% of total generation. The government is drafting a renewable energy plan to indicate how it intends to meet that target. Several wind farm projects are under way at the moment and some farms are close to finished. Part of the financing for the wind farms comes from the sale of carbon credits generated from the wind farm project. The wind farms started building in May 2014.

São Tomé and Príncipe has low wind farm energy potential as the wind measurements in the country

indicate that wind power development has relatively low potential. Topographical conditions mean the potential for the technology cannot be ruled out, however. A 2 MW demonstration project was launched in 2007 in the district of Caue, 90 kilometers from Sao Tome city, with technical support from German firms.

In Seychelles the potential for electricity generation from wind energy is present, with some sites having been identified as having average wind speeds of 6.9-7.5 m/s at 80 m. Recently 8 wind turbines were constructed on two different islands and connected via 3 kilometers of subsea cables. The turbines used are designed to work effectively in low-to-medium wind speeds, and are built so as to be resistant to corrosion from the salt and humidity of the location. Part of the wind turbines are located on the uninhabited islands of Ile du Port and Ile Romainville.

TIDAL ENERGY

Tidal energy is the energy obtained from changing sea levels. Electricity generation is achieved by capturing the energy contained in moving water mass due to tides. This kind of energy requires huge investment but can be beneficial for some SIDS in the long run. The key benefit of tidal energy is that it does not generate unsafe greenhouse gases and is totally predictable, as tidal currents result from perfectly known astronomical phenomena. However, tidal energy faces several challenges. In order to generate electricity from tide change one needs large current velocities which are relatively rare as slower tidal currents are not suitable for energy extraction. This can therefore only be used successfully in a few places round the world, where a large bay or estuary is so shaped that a huge amount of water rushes through a narrow opening when tides rise and fall. You need a 7 meter tide difference for tidal energy projects to be feasible so it depends on the island whether this tide difference is reached. Of the six African SIDS only Guinea-Bissau would be a potential site for a tidal energy project which experiences a high value of tidal

range on its coast, the highest along the west African coast. The presence of tidal estuaries further enhances the tidal range: its maximum recorded value is 6.80 m in Porto Gole, on the banks of Rio Geba.

Beside the fact there are thus only very few sites globally suitable for tidal barrages it also has other shortcomings. It only provides power for around 10 hours each day, when the tide is actually moving in or out. Another difficulty is the extremely harsh nature of the operating environment. Corrosion, bio fouling, lack of easy access to the turbines, and the expense of undersea cabling all pose large engineering challenges for the African SIDS which are low in technical and financial capacity. In addition, the lack of knowledge on the effects of tidal energy extraction are still largely unknown projects. Areas of high quality tidal resource are often sensitive marine environments. Tidal energy projects thus pose the same threats as large dams, altering the flow of saltwater in and out of estuaries, which changes the hydrology and salinity and possibly negatively affects the marine mammals that use the estuaries as their habitat.

MICROBIAL FUEL CELLS

Some alternatives to agriculturally grown biofuels are microalgal biofuels and marine microbial fuel cells. Culturing microalgae for biofuel production has several advantages in comparison to monocultures: 1) they grow at fast rates and can be harvested at short intervals; 2) culturing microalgae does not require arable and thus does not interfere with food security; 3) the consumption of algal biofuels produces fewer emissions than fossil fuels (Mutanda et al. 2011).

Microbial fuel cells (MFCs) are devices that can use bacterial metabolism to produce an electrical current from a wide range organic substrates. Due to the promise of sustainable energy production from organic wastes, research has intensified in this field in the last few years. While holding great promise only a

few marine sediment MFCs have been used practically, providing current for low power devices. The discovery that bacteria can be used to produce electricity from waste and renewable biomass has gained much attention. To further improve MFC technology an understanding of the limitations and microbiology of these systems is required. Some researchers are uncovering that the greatest value of MFC technology may not be the production of electricity but the ability of electrode associated microbes to degrade wastes and toxic chemicals.

PHARMACEUTICAL AND COSMETIC INDUSTRIES, GENETIC RESOURCES AND GENERAL SEA-BASED PRODUCTS

These sedentary living resources of the outer continental shelf, including marine genetic resources, may also prove to have considerable value. Given their extent the ocean offers great potential in terms of marine living resources including marine-derived genetic resources. The oceans are a rich source of biological molecules which could be used for research and development (Fedder, 2010). This is a result of the high species richness and the multitude of ecological influences on marine organisms. The oceans been estimated to account for 95 per cent of the Earth's biosphere but it has also been suggested that they remain 95 per cent unexplored. This helps to explain why around 1,000 new marine natural products are reported annually. This is especially relevant to deep water areas, as illustrated by the fact that of over 30,000 marine natural products reported since the 1960s, less than 2 per cent derive from the deep sea organisms. Marine biota (plants and animals) therefore represent a relatively untapped resource offering developmental potential for a range of valuable applications. There is a clear trend in bioprospecting activities suggesting a move away from terrestrial ecosystems towards marine and freshwater ecosystems. Marine biodiversity, which so far has only been vaguely explored, is believed to contain a high diversity of secondary metabolites

synthesized by the marine microfauna and microflora, and therefore is increasingly the focus of scientific research. Marine natural products seem to have a promising future in drug discovery (Leary, Vierros, Hamon, Arico, & Monagle, 2009). The potential of marine genetic resources is high (Leary et al. 2009). It is difficult to gauge the full market potential of marine genetic resources as there is a paucity of published commercial data, largely because much of this information is commercially sensitive. In 2002 global sales of marine biotechnology products, including anti-cancer compounds, antibiotics and antivirals, were estimated at about US\$2.4 billion. Most products have been developed from shallow-water marine sources (e.g. sponges, cone snails, tunicates, other invertebrates and algae) and only a few products from deep sea origins have made it to the market at this stage. Of the six African SIDS only Mauritius and Seychelles have engaged in marine genetic resource collection and/or research.

The Mauritius Oceanographical Institute initiated a project to valorise the pharmaceutical potentials of marine resources found in the Exclusive Economic Zone (EEZ) of Mauritius. The MOI focuses on the anti-cancer properties of the substances found in Mauritian marine sponges.

The potential of sponges from Mauritian waters to fight cancer is that they are one of the simplest forms of animals. They are found in shallow to deep waters and are normally attached to a surface. Owing to their immobility, sponges produce chemical compounds as a defence against predators. These compounds possess anti-viral, anti-tumour, anti-microbial and anti-cancer properties. MOI has a repository of different types of human cancer cells, which are used for testing purposes. The collection includes cancer cells from 8 different organs from the human body and thus allows MOI to study several deadly cancers. Sponge extracts are tested on cancer cells to investigate their medicinal properties. So far, the study has revealed

interesting anti-cancer properties of some sponge extracts obtained from Mauritian waters. Extracts from marine sponges and other organisms will be tested on other human cancer cells. Extracts with potential activity will be fractionated with the aim of isolating pure compounds. In Mauritius seaweed biomass research continued in 2009. The thrust would be the production of bio-fertilizer from the sap of seaweed and the generation of electricity from the combustion of the remaining biomass. In Seychelles up to 2000 many marine collection has been carried out (e.g. in the case of sponges). There is no evidence for marine-derived genetic resource research in the other four African SIDS.

Despite the large potential of marine-derived genetic resources there are also significant challenges and limitations. Securing and adequate supply of marine natural products is a major obstacle and the high costs of research are some of the problems. Commercialization of marine biotechnology products are still few and far between although a few examples do exist which also poses a challenge for African SIDS to fully reap the benefits of this potential. The United Nations Convention on the Law of the Sea (UNCLOS) is the key international instrument regulating all activities as well as the UN Declaration on the rights of Indigenous peoples. The current system stipulates bilateral exchange, under which a user of marine genetic resources, often a foreign owned company, returns a share of the benefits of utilization to the provider state where the user accessed the resource, in this case and African SIDS. However, problems exist with this systems as it fails to include other source states sharing the same marine genetic resource when demanding benefit sharing; it is ineffective because provider states, the African SIDS, cannot control the whole value chain of a particular marine genetic resource after exportation. States can thus not always benefit from the research carried out in its EEZ.

BLUE CARBON MARKET OPPORTUNITIES TO DEVELOPMENT OF AFRICAN SIDS

The UN Framework Convention on Climate Change (UNFCCC) has developed strategies and mechanisms to enhance terrestrial “Green Carbon” sinks. In recent years, however, there is increasing attention for marine and coastal ecosystems. The world’s oceans and coastal vegetation binds carbon in living organisms. Mangroves, seagrasses and marshes capture and store most of the carbon buried in marine sediment. These ecosystems have the equal capacity to sequester carbon both in their tree biomass as well as in the deep mud that accumulates around the roots . The abundance of mangrove forests, seagrasses and tidal marsh ecosystems in Africa, and particularly in African SIDS, makes “Blue Carbon” important for many of the six countries climate change strategies. It is increasingly being recognized that coastal ecosystems can offer equally rich carbon reservoirs and can offer potential mitigation benefits and provide similar types of projects. Yet they have been largely excluded in the global climate discussions within these mechanisms It is important to improve the ability of African SIDS to pursue carbon financing, via the UNFCCC or through voluntary carbon markets, as primary vehicles for supporting national and project-level Blue Carbon activities. In Kenya currently the first Blue carbon project is being carried out.²¹ In Kenya, Madagascar and Mozambique blue carbon work will be carried out with financial support from the GEF/UNEP.²² The Blue carbon project in Kenya, Mikoko Pamoja, highlights the financial benefits for local communities.²³ Through the Mikoko Pamoja project it is expected that coastal communities throughout Kenya and potentially internationally will benefit from mangrove conservation, restoration and protection supported with revenue from carbon credits. However, this does require fair benefit sharing of the projects profits.

21 <http://www.eafpes.org/index.php/mikoko-pamoja-section>

22 bluecarbonportal.org/download/11412/

23 Ibid.

Conserving and restoring terrestrial forests have for some time been recognized as important components of the international climate change mitigation debate through their ability to act as carbon sinks. The UNFCCC have developed different mechanisms such as Reducing Emissions from Deforestation and Forest Degradation (REDD+), Nationally Appropriate Mitigation Actions (NAMAs), and the Clean Development Mechanism (CDM). These types of projects provide opportunities and incentives for financial support to enhance conservation, restoration and sustainable use of natural systems such as forests. These types of programs has led to the economic quantification, purchase and trade of carbon 'credits'. Usually this has occurred within international and

national REDD+ programs whereby developing countries are compensated for maintaining carbon sequestration functions of their forests. The rapid growth of such markets offers potentials for small, equitable and self-sustaining conservation programs in developing countries. Several challenges still exists however in blue carbon trading. Although scientific evidence exists to support the carbon sequestration benefits of coastal ecosystems, there is currently no international regulatory framework or convention to protect the value of coastal and marine ecosystems for sequestration carbon and mitigating climate change. Blue carbon benefits have not yet been fully integrated into policy discussions within the financial mechanisms for climate mitigation.

III. CHALLENGES AND OPPORTUNITIES IN THE BLUE ECONOMY SECTORS

The previous section has shown the opportunities and challenges faced by the African SIDS. The different sectors hold potential yet also face severe limitations. Wind energy can only be developed on islands where there is sufficient wind, while tidal energy is only feasible in Guinea-Bissau. Opportunities do exist and the African SIDS have different interests and potential across the different blue economy sectors. Development of the different sectors are prove to have environmental and socio-economic consequences and development of the individual sectors can conflict with others. Port development in the Seychelles for example affects the surrounding environment. Conflicts between sea uses and demands for sea space are increasing.

CONFLICTS BETWEEN DIFFERENT BLUE ECONOMY SECTORS IN THE AFRICAN SIDS

- Development of ports are crucial for further economic development in e.g. fisheries but also cruise ship tourism. For African SIDS a position as a maritime shipping hub is very important. However, development of, or increased use of port often have environmental impacts such as air and water pollution, dredging, loss of wildlife habitat, aquatic nuisance species, restraining public access to coastal resources, and land conflict use issues. This in turn could therefore impact biodiversity and as a result impact the fisheries and tourist sector. Increased shipping through one's ocean also can cause environmental impacts e.g. oil spills as well as noise and ballast water disposal impacts.
- The Distant Water Fleets fishing in African SIDS' waters reap a large part of the fisheries potential the countries have. The crew is often foreign and only a limited amount of processing is done in the African SIDS. The offshore fishery sector thus provides limited opportunities for livelihood and employment for the local population.
- Tourism sector development will lead to a higher demand on energy which is already consuming a lot of foreign exchange earned by SIDS. The tourist sector creates waste and consumes large-scale energy and scarce water supplies.
- Aquaculture can create conflicts over competing land use in coastal areas in SIDS, mostly so with tourism and port development. In SIDS there is already significant amount of coastal pressure and for some aquaculture development projects placement in land, if possible, it could therefore be a preferred option.
- The growth of aquaculture puts increasing pressure on natural resource inputs, such as freshwater, energy and feed, which is already scarce in African SIDS. It also has environmental impacts, particularly due nutrients run off and waste disposal.
- Aquaculture can interfere with 'blue carbon' conservation projects as aquaculture can create environmental impacts in mangrove areas where 'blue carbon' projects can be expected to occur.
- Oil winning can have far reaching environmental consequences and thus impact marine life. It can create oil pollution, lead to oil spills and seafloor damage and thus impact the fisheries sector as well as tourism.
- Offshore oil and gas exploration can also create international maritime disputes as claims to ocean space are becoming increasingly valuable. The boundaries of the EEZ have thus become even more important.
- Deep sea mining has shown to have detrimental environmental consequences in some areas. Seabed mining may, for example, have detrimental effects on fish resources vital to coastal communities. The waste released may

contain sediment and heavy metals. Whales and other marine life might be affected by the noise. This can be expected to impact fisheries and further fisheries development as well as dive tourism.

- Tidal energy production have many environmental impacts of which the consequences for biodiversity and marine life are still unknown. Until scientific evidence exists Developing other renewable energy options is therefore perhaps more sustainable
- Marine derived genetic resource research in developing countries often fail to include fair benefit sharing between provider states

and those carrying out the research. African SIDS cannot control the whole value chain of a particular marine genetic resource after exportation and thus not always benefit from the research carried out in its EEZ.

- Blue carbon projects can give financial incentives at the national level yet might fail to trickle down to the local level. Mangrove and wetland restoration projects can also lead to exclusion of local populations. They often depend on the ecosystem services provided by these ecosystems and reduced use can affect their livelihoods.

IV. RECOMMENDATIONS

- Institutional arrangements exist on various individual blue economy sectors but no mechanism in place to facilitate the sharing of experiences, pursuing of mutual goals and sharing resources across the six African SIDS on the sector of “Blue economy” as a whole
- The six African SIDS should develop a forum and organize meetings to learn and share experiences and support each other in BE development. Dissemination and transfer of new technologies and expertise can assist the countries in developing the different sectors as some are more advanced in some sectors while others are more advanced in other sectors. As a result the position of African SIDS within the global SIDS group will be strengthened. In addition, it will provide a better position to interact with mainland Africa
- National, regional and international policy, regulatory and economic instruments can be used to promote blue economy pathways
- African SIDS also need to learn from Blue Economy development in SIDS in other regions such as Caribbean and Pacific. SIDS DOCK is such a type of initiative whereby Caribbean, Pacific and African SIDS are all part of this initiative to develop renewable energy in these regions. This collective institutional mechanism will assist them in transforming their national energy sectors into a catalyst for sustainable economic development and help generate financial resources to address climate change challenges.
- Fisheries governance is of crucial importance: fisheries need to have effective ecosystem based governance systems in place. Regional fisheries bodies need to be strengthened as well as national fishery management agencies.
- Supporting environmentally technologies in fisheries and aquaculture are necessary: including low impact, fuel efficient fishing methods; using environmentally friendly feeds; ensure safe waste management disposal of aquaculture and fish handling, processing and transportation
- Benefits of DWF fishing should be more equally distributed. Often African SIDS fail to reap large-scale benefits from their fishery, both at a national as well as a local level. Improving ports and having fish processing facilities can help reap a larger part of the value chain profits for the countries involved.
- For the tuna fishery that is processed in the country a global value chain analysis of the tuna fishery needs to be made to ensure proper benefit sharing between the SIDS and foreign license owner. Part of a ‘blue economy’ fishery sector is one equitably distributes the benefits to both small-scale fishers, industrial fishers, market parties, governments as well as those living in coastal communities.
- For aquaculture the 2011 FAO Technical Guidelines on Aquaculture Certification constitute an additional important tool for good governance of the sector. Before developing further aquaculture projects African SIDS should take these tools into consideration.
- African SIDS should examine their national aquaculture development policies, strategies, plans and laws, and use “best management practices” and manuals on farming techniques that have been promoted by industry organizations and development agencies to improve this sector
- For aquaculture to be feasible in these countries, small-scale pilot projects for technology transfer and evaluation need to be carried out. In addition, economic feasibility studies and marketing analyses for aquaculture proposals need to be carried out.

- In African SIDS there is already significant amount of coastal pressure and for some aquaculture development projects placement in land, if possible, it could therefore be a preferred option.
- Development of the aquaculture sector also demands a role of the private sector to invest in development of sustainable fish markets; for national institutions to develop an appropriate aquaculture policy and legal framework for aquaculture development; the need to build capacity and train fish farmers.
- Investment in sea ports construction and rehabilitation, will contribute to consolidating territorial integration and facilitating movement of goods and people. Port development is crucial but often very capital intensive so international financial support should be sought.
- Climate change is expected to impact the shipping sector and adaptation needs to be considered when building new, or improving old ports. Adaptation in transport involves enhancing the resilience of infrastructure and operations through, amongst others, changes in operations, management practices, planning activities and design specifications and standards. Climate change thus needs to be integrated into considerations into investment and planning decisions for ports as well as into broader transport design and development plans.
- Reducing pollution caused by ships through discharges and implementation of International Maritime Organization (IMO) standards
- The private sector must be mobilized to support sustainable tourism and needs access to financing for investing in greening the sector. The use of internationally recognized standards can assist businesses to understand aspects of sustainable tourism and mobilize investment.
- Structural reforms are needed to have the local get a better share of the benefits of the tourist industry and more general sharing of the benefits. This could be through the organization of local production of goods and services, the creation of a quality certification system for local products, and improvements in the inter-islands transportation systems and more substantially the ownership of tourism infrastructures that currently belong to foreigners
- As tourism creates a great demand on scarce energy and water resources tourist development should go hand in hand with renewable energy development.
- It is crucial to build human capital in the countries involved by means of training and education on new developments in the different Blue Economy sectors.
- Technologies must be made accessible, affordable and adaptable to the needs and particular circumstances of African SIDS. The international community, particularly developed countries but also including some mainland African countries and organisations, should provide financial resources, technology transfer and capacity building to SIDS.
- To develop a fishery based on 'blue economy' should focus on the overall recognition of the wider societal roles of small-scale fishers based on their influence on poverty reduction and food security (UNEP, 2012). This should be achieved by a comprehensive governance framework managing externalities within and outside of the sector, implementing an ecosystem based approach to fisheries and aquaculture with fair and responsible tenure systems that foster stewardship and social inclusiveness, and integrating fisheries and aquaculture into watershed and coastal area management.
- Oil and gas exploration and production should carefully take environmental concerns into consideration. Countries should therefore sign the Extractive Industries Transparency Initiative;
- The African SIDS should seek international assistance to get the best possible financial

and environmental benefits when negotiating contracts with oil, gas and foreign fishing companies;

- African SIDS negotiators can use potential of the carbon benefits of “Blue carbon” and use this as opportunities to attract financing for the conservation and restoration of vital marine and coastal ecosystems. “Blue carbon” credit trade has the potential to provide large-scale economic benefits for African SIDS as they are endowed with large mangroves, marshes and seagrasses. Conservation and restoration of these mangroves, seagrasses and marshes can thus potentially provide much more economic gains in the long term ranging from the community to the national level than the short term gains that are made from destruction of these habitats. Blue Carbon should therefore be more fully integrated into international policy discussions on climate change mitigation by African SIDS negotiators, as well as within regional and national policy discussions on marine and coastal management frameworks.
- The best opportunities for African negotiators to influence policy lie in the further development and expansion of IPCC guidelines (e.g. to include seagrasses or mangroves) and integration Blue

Carbon into existing NAMA and REDD+ agendas. Other potential lies in the definition of activities qualifying for NAMAs, which countries are able to tailor to their specific needs and mitigation potential. They can be used to promote capacity building and awareness programs around ecosystem services and carbon sequestration. Several countries, such as Sierra Leone, Eritrea and Ghana have submitted coastal wetland related NAMAs, African SIDS should follow suit.

- Countries with abundant coastal vegetation (e.g. mangroves) can also seek financing from the UNFCCC’s Adaptation Fund.
- A key component of international cooperation for the Blue Economy approach is Research. A science-based approach is essential to the development of the Blue Economy; commencing with the initial assessment and critically the valuation of the blue capital at the disposal of the African SIDS. This will provide a basis for informed decision-making and adaptive management and pathways for development of the different BE sectors. This underlines the importance of technical assistance, technology transfer and capacity building to the pursuit of sustainable development.

V. CONCLUSION

The sea and the coasts are drivers of the economy in the African SIDS and offers a lot of developmental potential. The concept of the Blue economy is still under development. In practice, however, this report shows that the sectors that are part of the BE is in many cases already well developed in many African AIDs. This report has shown the pathways for development of the different Blue Economy sectors in African SIDS: fisheries, aquaculture, shipping and maritime transport, tourism and non-renewable and renewable energy, marine genetic resources as well as blue carbon trading. The different sectors are of great importance to the African SIDS yet all provide different stages of development for the six countries. This also provides opportunities for cross country information and technology exchange. The potential for development per sector, nevertheless, also differs per African SIDS due to specific ecological, geographical, political circumstances as well as technological and

human expertise. It however also poses challenges mostly in the form of environmental externalities and socio-economic consequences for local populations. Development of the different sectors should take the conflicting interest of other sectors into considerations as well as the environmental and socio-economic consequences. The interconnectedness of the different sectors has become clear. Institutional arrangements should be made to facilitate the sharing of experiences, pursuing of mutual goals and sharing resources across the six African SIDS on the different BE sectors as well as between African and other SIDS (e.g. Caribbean and Pacific SIDS). Technologies must be made accessible, affordable and adaptable to the needs and particular circumstances of African SIDS by the international community, including mainland Africa.

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