



A man diving next to the shore of Gili Air, Lombok Indonesia. Credit: Chris, Adobe Stock.

2

The blue economy: Who knows what?

ABSTRACT

The 'blue economy' has become a key agenda for contemporary coastal and island nations, with a focus on developing (or industrializing) coastal and ocean space for economic prosperity. Key to such an agenda is how the ocean economy can be made more sustainable.



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The economic and cultural identity of many nations has long been connected to the ocean, particularly for Small Island Developing States (SIDS). The difference now is that connection is intensified with a more coordinated and sustainable approach in mind, one that combines development with environmental stewardship and conservation. This chapter gives an overview of the blue economy and highlights knowledge management and the role it plays in supporting an innovative blue economy, particularly in SIDS, highlighting Seychelles as an example. Attention to the blue economy also allows for clearer framing of international engagement and collaboration to ensure that local customs and practices are valued and woven into development and management plans. The chapter highlights how the local knowledge system influences the quality of decision-making, and adaptive management to empower impactful local engagement in advancing a more sustainable ocean economy.

INTRODUCTION

Globally, and particularly for coastal and ocean nations, there is an increasing focus on developing (or industrializing) coastal and ocean space to increase economic prosperity. This is not new. The economic and cultural identity of many nations has long been connected to the ocean. Nations have relied on, and continue to rely on, the ocean for transport, food, environmental services, and climate regulation.

During the Rio+20 preparation meetings, in 2011 the term ‘blue economy’ was highlighted by various delegates, particularly those from Small Island Developing States (SIDS), as a way to capture the role of the ocean in sustainable development (IISD, 2011). Jouffray et al. (2020) note that the late twentieth century and first part of the twenty-first century saw an intense focus on developing ocean spaces, a phenomenon they referred to as ‘blue acceleration.’ This has led to cumulative pressures on marine ecosystems from climate change, ocean acidification and heating, marine pollution, and changing ecosystem structures that transcend political boundaries (Jouffray et al., 2020). In response, attention with a more sustainable approach in mind has evolved, one that combines development with environmental stewardship and conservation (Lee et al., 2021). This approach has been labelled the ‘blue economy’; a term used when referring to ocean-based sustainable development agendas. Some literature (e.g., UNECA, 2016) also applies this expansion to lake ecosystems, linking the blue economy to countries that hold large freshwater ecosystems.

The blue economy is founded on principles of sustainability. Sustainability is complex and intertwined, embracing cultural, social, ecological, environmental, economic, and political factors. In line with concepts of sustainability, it also considers aspects of consumption, a circular economy (including aspects of marine pollution), reducing carbon footprints, improving resource efficiency, reducing ecological scarcity, and systems thinking (Loiseau et al., 2016; Robertson, 2014; Ruggerio, 2021). Although

founded on principles of sustainable development, the blue economy focuses on equitable processes and benefits (Cisneros-Montemayor et al., 2022). The realization of a blue economy is influenced by the extent to which the location and local community are intertwined in blue economy-related development plans (Niner et al., 2022). The development of a blue economy can enable an “integrating policy framework for sustainable development” (Benzaken et al., 2022) that enables complex decision-making across multiple sectors that operate locally in overlapping environments. It also allows for clearer framing of international engagement and collaboration to ensure that local customs and practices are valued and woven into development and management plans. Many coastal and island nations have advanced initiatives to make their ocean economies more sustainable, with some having a national strategy to guide this.

The local context and understanding of sustainable development play a central role in how ocean-based sustainable development strategies evolve. In small island developing states (SIDS), the development and implementation of these strategies are influenced by long-standing development challenges intrinsic to SIDS. As a starting point, these challenges were captured by Briguglio (1995) to include those related to economic disadvantages due to their small (land) size which results in a strong dependence on importation, exportation, and foreign exchange earnings, remoteness and insularity, the social and economic costs of impacts from natural disasters, pressure on the environment from development, resource dependence and increasing frequency of natural disasters, as well as social and demographic changes that result from brain and skills drain as people seek jobs, specialization, and education opportunities in urban centres, other islands, and other countries.

In 2013, the Seychelles Ambassador for Climate Change and SIDS noted that islands may be small in land area, but they become large ocean states when their exclusive economic zones are factored in. He illustrated that political will and innovative thinking are evident in SIDS, but that technical, institutional, technological, and financial capacity is lacking (Jumeau, 2013).

The blue economy has created a space for SIDS to individually and collectively claim the rights and responsibilities related to their large ocean states. Many SIDS have leveraged innovative initiatives and partnerships to overcome the challenges outlined above to advance their ocean-based sustainable development goals. Such partnerships have challenges, and a key issue remains related to the capacity of SIDS to fully implement programs and projects initiated by external partners. The local knowledge system influences the quality of communication, implementation, decision-making, and adaptive management and has the potential to empower impactful local

THE REALIZATION OF A BLUE economy is influenced by the extent to which the location and local community are intertwined in blue economy-related development plans (Niner et al., 2022).

engagement in advancing a more sustainable ocean economy. The remainder of this paper will explore the links between sustainable development, the blue economy, and the role of knowledge systems in more detail, highlighting examples of initiatives that have evolved in Seychelles.

SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT

Various initiatives have evolved to address sustainability and the role it plays in human development (for current and future generations) through the lens of sustainable development, which considers the interlinked components of ecological integrity, economic opportunity, and social progress in variable degrees (Mensah, 2019; Robertson, 2014). Although much debate exists around the complexity of defining and implementing sustainable development agendas and the role of degrowth approaches, various initiatives have evolved in an attempt to mitigate impacts from economic growth paradigms.

ISLANDS NATIONS, IN particular, are vulnerable to pressures from climate change and unchecked implementation of blue economy frameworks can compromise island resilience, and ultimately their ability to advance sustainable development (Telesford, 2021).

The ‘political’ concept of sustainable development is widely recognized as having emerged out of the United Nations’ World Commission on Environment and Development (1987), with major international documents conceptualized from related post-events, for example, the Rio Declaration on Environment and Development and Agenda 21, the Convention on Biological Diversity, the Framework Convention on Climate Change, and the Forest Principles (Mebratu, 1998). These documents contain recognized concepts vital to advancing sustainable development and set a benchmark for related global governance initiatives.

The United Nations Sustainable Development Summit in 2015 facilitated the development of the “Transforming Our World: The 2030 Agenda for Sustainable Development,” which includes the 17 Sustainable Development Goals (SDGs) adopted by all United Nations (UN) members in September 2015. Biermann et al. (2017) note that past global governance efforts to advance sustainability agendas have been linked to top-down regulation or market-based approaches, but the SDGs facilitate global governance by goal setting. The SDGs recognize the influence of social-ecological relationships on sustainable development and the links to international law related to, for example, human rights and biological diversity (Morgera, 2020; Niner et al., 2022), but are not legally binding (Biermann et al., 2017).

Thompson (2018) notes that the SDGs facilitate global solution building and that science and diplomacy play a fundamental role in this, but that there is a need for stronger institutional architecture and engagement from “states and corporations,

scientists and policy makers, practitioners and civil society across the global North and South” (p. 46) if the SDGs are to be realized. Islands nations, in particular, are vulnerable to pressures from climate change and unchecked implementation of blue economy frameworks can compromise island resilience, and ultimately their ability to advance sustainable development (Telesford, 2021).

THE BLUE ECONOMY AND SUSTAINABLE DEVELOPMENT

The green economy was one of the themes of the Rio+20 Conference on Sustainable Development in 2012 and aimed to develop national policies and international cooperation to enhance sustainable development efforts (Allen & Clouth, 2012). UNEP (2011) states that a green economy does not replace sustainable development but focuses on greening the economy as a pathway to sustainability, with national regulations, policies, subsidies and incentives, international market and legal infrastructure, and trade aid protocols providing an enabling environment for this.

During the Rio+20 preparation meetings, the term ‘blue economy’ was highlighted by various delegates, particularly those from SIDS, as a way to capture the role of the ocean in sustainable development (IISD, 2011). Although the term had already been used in 2009 by the Senate Committee of Commerce, Science, and Transportation of the United States, the Blue Economy Initiative for Green Growth in Korea (Martínez-Vázquez et al., 2021) and by Gunter Pauli who explores progressing sustainability and development through nature-inspired technology and innovation (Pauli, 2017), the blue economy in relation to ocean-based sustainable development established a place in global diplomacy during the Rio+20 conference in 2012. The outcome document that emerged from this titled “The Future We Want” includes detailed actions related to the ocean and seas in the “Framework for action and follow-up” section and emphasizes the importance of the conservation and sustainable use of the ocean and seas (Purvis, 2015).

The UNEP et al. (2012) report titled *Green Economy in a Blue World* was written to capture the role of the ocean and seas in the green economy and highlighted fisheries and aquaculture, maritime transport, marine-based renewable energy, ocean nutrient pollution, coastal tourism, deep-sea minerals and SIDS (and the ocean) as central to the green economy (Silver et al., 2015). The Economist Intelligence Unit prepared a briefing paper for the 2015 World Ocean Summit that captured the ocean economy as seen in Table 1. The document included a working definition of a blue or sustainable ocean economy as one that “emerges when economic activity is in balance with the long-term capacity of ocean ecosystems to support this activity and remain resilient and healthy.”

TABLE 1: Components of the Ocean Economy

Ocean-based Industries				
Adapted from the EIU (2015) and Attri and Bohler-Mulleris (2018), activities linked to the ocean economy, *can contribute to the protection/restoration of ocean health				
Type of Activity	Ocean Service	Ocean Industry (emerging, does not imply sustainable*)	Drivers of Growth	Example of SDGs that could be ad- vanced through the BE (excl. SDG 14)
Harvest of living resources	Seafood	Fisheries (sustainable*)	Food security	SDG 1, 2, 3
		Aquaculture (multi-species)	Demand for protein	
	Marine biotechnology	(Pharmaceuticals, chemicals)	R&D for healthcare and industry	SDG 3, 9
Extraction of non-living resources, generation of new resources	Minerals	Seabed mining (deep)	Demand for minerals	SDG 8, 9
	Energy	Oil and gas	Demand for alternative energy sources	SDG 7, 8, 9
		(Renewables)		
Freshwater	(Desalination)	Demand for fresh-water	SDG 6	
Commerce and trade in and around the oceans and coastal space	Transport and trade	Shipping	Growth in seaborne trade; international regulations	SDG 8, 9
		Port infrastructure and services		SDG 9, 10
	Tourism and recreation	Tourism (eco)	Growth of global tourism	SDG 1, 8, 11
		Coastal development	Coastal urbanization	SDG 3, 9, 11
Response to ocean and coastal challenges and climate change resilience	Ocean monitoring and surveillance	(Technology and R&D)*		SDG 6, 13
	Carbon sequestration	(Blue carbon)*	Growth in coastal and ocean protection and conservation activities	SDG 11, 13
	Coastal protection	(Habitat protection and restoration)*		SDG 15
	Waste disposal and pollution	(Assimilation of nutrients and waste)*		SDG 3, 6

An ocean economy or a blue economy?

The term ‘ocean economy’ captures all the activities that are linked to the commercial benefits and economic activities related to the ocean, and more work is emerging to define what a sustainable ocean economy embraces, e.g., the ‘blue papers’ produced by the High Level Panel for a Sustainable Ocean Economy (HLP SOE) (Cisneros-Montemayor et al., 2022). The Blue Papers form part of a multi-stakeholder knowledge generation and sharing platform supported by the World Resources Institute. Many other organizations have produced documents detailing approaches to ocean-based sustainable development, through strategic or sectoral approaches, e.g., the World Wildlife Fund’s Principles for a Sustainable Blue Economy (and other work) (see Figure 1), the Organisation for Economic Co-operation and Development’s work in support of a sustainable ocean, the World Bank PROBLUE initiative, *The Economist* magazine’s World Ocean Initiative, and the Swedish Agency for Marine and Water Management’s SwAM Ocean program for development cooperation, etc.

The concept of the blue economy, although founded in principles of sustainable development, has been blamed for prioritizing economic opportunity, with sustainable development objectives usually met through extensive exploitation strategies which have the potential to favour powerful actors who are usually removed from the activity (Niner et al., 2022). The ocean is often seen as having inexhaustible resources and is used as a reservoir for our waste (Golden et al., 2017). Although advancing SDG 14 (Life Below Water) and many of the other SDGs are linked to advancing the blue economy, it has been criticized for not meeting the social-economic context that influences the progress of SDG 14 (Lee et al., 2020; Niner et al., 2022; Singh et al., 2018). Novaglio et al. (2022) emphasize that a more sustainable approach meets multiple

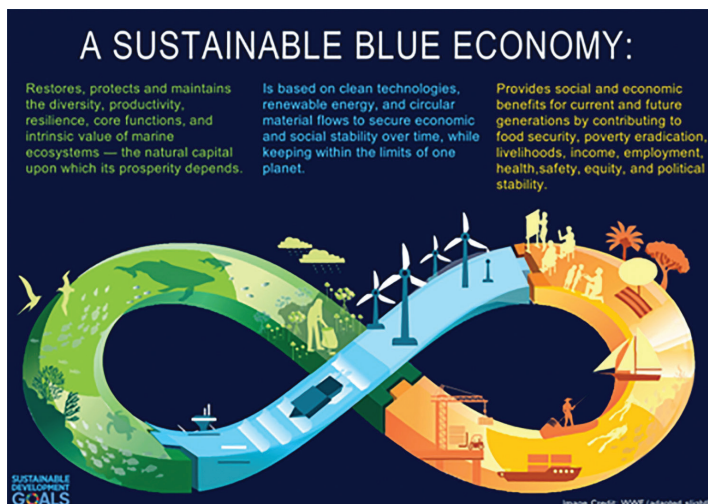


Figure 1: Core components of the blue economy as captured by WWF. Source: WWF, ocean.panda.org.

SDGs and ensures inclusivity, with fair and equitable access to resources and technologies. The development of a more sustainable ocean economy requires more holistic engagement and inclusion of a complex combination of stakeholders and actions at multiple levels, and this can be guided by the development of a blue economy frame-

INTERGOVERNMENTAL AND nongovernmental organizations have influenced the direction of ocean policy, but there is still a need for more integrated and locally driven initiatives that are embedded within communities (Cisneros-Montemayor et al., 2022), initiatives that allow diverse engagement, particularly inclusive of youth and marginalized communities.

work. Islands nations, in particular, are vulnerable to pressures from climate change and unchecked implementation of blue economy frameworks can compromise island resilience, and ultimately their ability to advance sustainable development (Telesford, 2021). The implementation of a blue economy framework should bring together science and technology in a way that facilitates the development of integrated knowledge systems that are useful, accessible, and relevant.

The ocean economy is not only relevant for coastal and island nations, as many of these sectors are relevant to land-locked countries that depend on the ocean for food, trade, minerals, climate regulation, etc. Many ocean industries require infrastructure and capacity that is land-based, but more is being done to explore technological development and infrastructural requirements for offshore multisectoral expansion

opportunities. The strategy and technological advancement needed to expand established ocean sectors into offshore waters bring different opportunities and challenges (Novaglio et al., 2022). According to Novaglio et al. (2022), challenges include a “lack of infrastructure and technology to support emerging offshore sectors, limited understanding of environmental impacts, inequitable outcomes, and a lack of planning and governmental oversight” (p. 209).

Who are the stakeholders and what sectors are involved?

As the ocean enters a new phase of large-scale industrialization (Allison et al., 2020; Jouffray et al., 2020), the increase in unintended societal costs need to be understood, monitored, and managed to mitigate potential marginalization and dispossession of traditional cultural, recreational and small-scale commercial actors (Allison et al., 2020; Bennett et al., 2015; Hadjimichael, 2018). Although founded on principles of sustainable development, the difference in the blue economy when compared to other approaches is that it features equitable processes and benefits (Bennett et al., 2019; Cisneros-Montemayor et al., 2022; Allison et al., 2020) Cisneros-Montemayor et al. (2022) give some examples of the components that can be linked to the relevant pillars that feature in the blue economy, noting that these need to be locally evaluated

and contextualized while using existing and emerging scholarship and evidence to support innovative planning, policy, and progress:

- Social equity – e.g., ensuring group and economic equity, gender equality, corruption control, access to public health and human/children’s rights considerations, etc.
- Environmental sustainability – action relating to, for example, ensuring ecological function and habitat protection, pollution and water quality control, and maintaining species abundance and distribution, etc.
- Economic viability – e.g., facilitating physical and financial infrastructure, national stability, and stable banking systems, etc.

Each of the various sectors that form part of the blue economy has its own way of operating, with its own unique mix of stakeholders, complexities, and overlaps, and this makes policy approaches linked to large, interconnected ocean systems (from local to global) complicated (Cisneros-Montemayor et al., 2022; Nash et al., 2020). Intergovernmental and nongovernmental organizations have influenced the direction of ocean policy, but there is still a need for more integrated and locally driven initiatives that are embedded within communities (Cisneros-Montemayor et al., 2022), initiatives that allow diverse engagement, particularly inclusive of youth and marginalized communities. Inclusive, effective, and accessible ocean literacy (Worm et al., 2021) and advocacy play a vital role in ensuring knowledge is accessible and supports transparency and accountability.

A table compiled by Park et al. (2014) gives a streamlined example of the sectors and categories that can form part of the ocean economy (see Table 2). The table illustrates the diverse nature of the ocean economy, beyond fisheries and other easily recognized ocean industries and the sectors (and stakeholders) that support these. The various local components of all these sectors need to be transparently captured to understand the dynamics of local ocean economies. This allows for funding and action to be strategically and effectively allocated to advance ocean-based sustainable development approaches that depend on building the ocean economy. Blue economy strategies are evolving in many coastal and island nations to support the visualization of a more sustainable ocean economy (Fenichel et al., 2020).

TABLE 2: An Example of a Classification System of the Ocean Sectors (Park et al., 2014)

SECTORS	DEFINITION	CATEGORIES
1. Fisheries	The economic activity related to the production, processing, and distribution of seafood.	1) Fishing 2) Aquaculture 3) Seafood processing 4) Seafood distribution and wholesale
2. Marine mining	The economic activity related to the production, extraction, and processing of non-living resources in the seabed or seawater. But it doesn't include offshore oil & gas.	1) Marine aggregates (limestone, sand, gravel) 2) Seabed resources 3) Salt 4) Seawater dissolved minerals extraction
3. Offshore oil & gas	The economic activity related to the exploration and production of offshore oil and gas, includes operating and maintaining equipment related to this activity. It doesn't include building offshore platforms, equipment, and OSVs.	1) Oil and gas E&P 2) Offshore supply services
4. Shipping and port	The economic activity related to the transportation of freight and passengers through the ocean and river, and related to operation and management of ports.	1) Passenger transportation 2) Freight transportation 3) Shipping business services 4) Port development 5) Port O&M (storage, load and unload, trucking, etc.)
5. Marine leisure & tourism	The economic activity related to marine and coastal leisure and tourism, which includes eating & drinking places, hotels & lodging places, marinas, marine sporting goods retailers, zoos, aquariums, recreational vehicle parks & campgrounds.	1) Eating & drinking places 2) Hotels & lodging 3) Marinas, marine sporting goods retailers, zoos, aquariums, recreational vehicle parks & campgrounds 4) Marine festival, etc.
6. Marine construction	The economic activity which includes construction in the ocean and relates to the sea.	1) Marine construction (seabed cables, pipeline) 2) Marine related to construction (ports, bridges, etc.)

7. Marine equipment manufacturing	The economic activity which includes manufacturing of marine equipment and materials, such as various machinery, valve, cable, sensor, ship materials and so on (no building, repair and/or conversion and supply services).	<ol style="list-style-type: none"> 1) Machinery valve, cable, sensor, ship components 2) Research equipment 3) Others
8. Shipbuilding & repair	The economic activity related to the building, repair, and maintenance of ships, boats, offshore platforms, and OSVs.	<ol style="list-style-type: none"> 1) Ship & boat building 2) Ship & boat repair and maintenance 3) Offshore platform & OSV building 4) Offshore platform & OSV repair and maintenance
9. Marine business services	The economic activity related to services to support ocean industry like finance, consulting, technical services, and so on.	<ol style="list-style-type: none"> 1) Finance & insurance, marine consulting 2) Rental 3) Technical services 4) Inspection 5) Ocean engineering, S/W service 6) Labour supply services 7) Others
10. Marine R&D and education	The economic activity which is related to research and development, education, and training.	<ol style="list-style-type: none"> 1) Research and development 2) Education and training
11. Marine administration	The economic activity related to defense, coast guard, security, navigation and safety, coastal & marine environmental protection by government or public and private organization.	<ol style="list-style-type: none"> 1) Defense, coast guard, security 2) Navigation and safety 3) Coastal & marine environmental protection 4) Organization (government, public, NGO).
12. Others	The economic activity which is not classified elsewhere. It also includes economic activity related to development of the ocean resources, which are ocean renewable energy, marine living resources, seawater and spatial, but just enter into the early commercial stage.	<ol style="list-style-type: none"> 1) Ocean energy (tidal, wave, OTEC, offshore wind) industry 2) Marine bio industry 3) Seawater desalination 4) Marine CCS 5) Others which are not classified elsewhere



Man fishing in Seychelles. Source: Freesurf, Adobe Stock.

What management approaches are aimed at supporting the blue economy?

The increasing recognition of the importance of all aspects of sustainability in the context of emerging blue economies allows for natural and social science to play a transformational role in influencing the extent to which sustainability is reflected in policy development (Niner et al., 2022). Understanding the interaction between the ecological, economic, and social components that form part of sustainability can help identify effective and efficient policy priorities (Singh et al., 2018). Nash et al. (2020) highlight the integrated nature of sustainability in relation to the economy, society, and the biosphere (the global ecological system), but note that there are gaps in the ability of indicators to measure the trade-offs and synergies between this interaction. This in turn influences how policy is developed, and the lack of clarity can impede the development of policies that consider this complexity (Nash et al., 2020). Research plays an important part in evolving new ideas, but various authors note that it is influenced by the disciplines and interests of academics and researchers (Lee et al., 2021). Whether this research is taken up by decision makers or integrated into policy (and how) could also be influenced by mobilization bias and personal agenda (Theis & Tomkin, 2013).

Assessing the sustainability of blue economy plans will be influenced by the sum of the parts that make up a nation's blue economy and related strategies, plans, and sectoral initiatives. While there are many views on what sustainability is (and is not)

and how it is working (or is not), the intention of any vision, action plan, or initiative could be evaluated against the extent to which sustainability is considered and implemented with the aim of achieving a sustainable outcome. It may be challenging to determine whether the outcome is sustainable, but the tools to plan for and support more sustainable action have been considered by many academics and practitioners.

According to Winther et al. (2020), the goal of integrated ocean management (IOM) is related to ensuring the long-term health and resilience of marine ecosystems while improving livelihoods using an integrated and adaptive resource management approach. It is a holistic, ecosystem-based, and knowledge-based approach aimed at balancing user needs while considering various aspects of the marine environment and sustainability (Winther et al., 2020). Ecosystem-based management and related marine spatial planning form the foundation of IOM (Winther et al., 2020). Value creation and developing partnerships between public authorities, businesses, civil society, academia, and financial institutions are vital across ocean-based activities (Winther et al., 2020). There are various tools used to support a more sustainable ocean economy under the umbrella of IOM, including ecosystem-based management (or an ecosystem approach), marine/maritime spatial planning, integrated coastal zone management (ICZM), adaptive ocean management, area-based measures (e.g., marine protected areas), etc. (Winther et al., 2020).

ADAPTIVE MANAGEMENT is the “systematic process of continually improving management policies and practices towards defined goals by learning from outcomes of previous policies and practices” (Katona et al. 2017, in Winther et al., 2020 p. 1453).

Marine ecosystems are dynamic, with fluctuations in physical, chemical, and biological dimensions, exacerbated by climate change, and ocean management and governance need to account for this dynamic environment. Adaptive management is the “systematic process of continually improving management policies and practices towards defined goals by learning from outcomes of previous policies and practices” (Katona et al. 2017, in Winther et al., 2020, p. 1453).

Threats to ocean health are multiscale and interconnected, acting in a non-linear way, creating cumulative impacts that are difficult to assess and predict, and leading to incomplete solutions (One Ocean Hub, 2021). Countries have their own unique knowledge generation and management systems, resources, and capacities to understand, value, and make decisions on marine biodiversity, particularly in the deep seas and areas beyond national jurisdiction (One Ocean Hub, 2022). It is challenging to improve decision-making and management approaches without sufficient and authentic data that is user-friendly.

Adapting key blue economy enabling mechanisms compiled by Göthberg et al. (2022) highlights critical considerations that form part of an integrated knowledge system:

1. Adequate, accessible, and well-maintained infrastructure to support innovative research approaches and knowledge co-production to support adaptive management and sustainable decision-making.
2. Financing (and credit) that supports new investment, appropriate technological upgrades, and strengthened resilience for long-term research that meets the needs of industry, decision-makers, and managers.
3. Buy-in (value creation) and community engagement to support development opportunities through multi-level/cross-sectoral engagement that improves knowledge co-production.
4. Coherent and predictable legal frameworks and policy to support decision making, that is clear to the community, investors, businesses, and managers.
5. Effective environmental regulations that are evidence-based, context-adapted, and locally understood and built on the best available research and science that supports knowledge co-production as part of an integrated knowledge system.
6. Well-functioning value chains where impactful research is considered in its broadest and most holistic sense.
7. Good governance and functioning institutions that are visioned, enabled, and dynamically supported while ensuring that knowledge is meaningful, relevant, and useful.
8. Improved technology and better processes are enabled through innovation to allow for creative solutions to evolve that address complex global problems at various levels.
9. Strategic planning that allows for opportunities and conflicts over resources and space to be navigated to support policy development, decision-making, and adaptive management that builds relationships, and empowers innovative (and collaborative) approaches and change.

Ocean ‘literacy’ and scientific capacity influence the successful implementation of any blue economy strategy. Knowledge co-production is being supported through various organizations like the High Level Panel for a Sustainable Ocean Economy (HSPLOE) and the Decade of Ocean Science for Sustainable Development (2021–2030). Multinational, multi-partner projects are also being funded by various countries, for example, the One Ocean Hub and the Blue Economy Cooperative Research Centre. Various work is underway to build on existing tools and frameworks to support tools for measuring production, sustainability, and social progress (Fenichel et al., 2020), e.g., the Global Ocean Accounts Partnership and the European Commission’s Sustainability Criteria for a Blue Economy.

Seychelles and the blue economy: Where is the innovation?

Coastal and island nations rely on coastal and marine ecosystems and resources to sustain their population, build their economies, and feed their cultural and spiritual well-being. Momentum to advance ocean-based sustainable development on island nations has been energized as global efforts to advance the blue economy have evolved

substantially since the Rio+20 Conference in 2012. The benefits of an ocean-based sustainable development approach allow island nations to progress from a position that is locally contextualized in historical experience and practice. With global acknowledgment of the vital role that the ocean plays in prosperity and well-being, SIDS have an opportunity to seek partnerships and collaboration that enhances their development potential. This has allowed them to build partnerships that support knowledge systems that advance their ambitions in a locally meaningful way. Thompson (2018) highlights the inequality that results from research conducted by international organizations within the exclusive economic zones of LDCs and SIDS. When research is available, it is often not applicable, accessible, or affordable to their (sustainable) development needs. She notes that:

Our modern knowledge economy is increasingly driven by information, science, data and technology. Ownership of and access to these knowledge products either generates wealth or shut us off from it, potentially increasing the chasm between rich and poor. The world's thirty-eight SIDS and forty-eight Least Developed Countries (LDCs) are at a particular disadvantage in this knowledge economy. These countries do not unilaterally have the resources or abilities needed to build knowledge banks and R&D programmes sufficient for addressing their national development needs. As policy makers from such countries, we generally rely on and benefit from the knowledge and products of international scientific research (p. 45).

The Government of Seychelles has actively supported sustainable development initiatives since the launching of Agenda 21 (Purvis, 2015), and has been recognized as a leader in advancing efforts to build a sustainable ocean economy through the development of their national blue economy strategy. Although Seychelles is classified as high-income, it still faces challenges linked to being a SIDS, including vulnerability to economic shocks, impacts from climate change, capacity challenges, etc. However, the mechanisms and approaches are being driven to locally contextualize aspects of IOM within the limitations of what exists, building on experience, while relating international expectations and best practices. The local knowledge system influences the quality of decision-making and adaptive management and has the potential to empower impactful local engagement in advancing a more sustainable ocean economy. Various work has highlighted key blue economy-related advances and challenges in Seychelles to date (e.g., Benzaken & Hoareau, 2021; Benzaken et al., 2022; Schutter & Hicks, 2019; Senaratne, 2020), but key initiatives are mobilizing a more impactful knowledge system in Seychelles.

Seychelles entered into a debt restructuring program that was finalized in 2015 and linked to the creation of a marine spatial plan (MSP) for the entire exclusive economic zone. A new Act was passed to support the creation of the autonomous Seychelles Conservation and Climate Adaptation Trust (SeyCCAT). The Trust manages the proceeds from the debt restructuring and ensures related funded projects are linked

to the stewardship of Seychelles' ocean resources and blue economy (Sumaila et al., 2021). SeyCCAT is held locally and internationally accountable and undertakes regular reviews to support improved and adaptive investment and management. It facilitates and resources collaboration with various research partners (local and international), aiming to facilitate meaningful knowledge co-production that is locally relevant.

IN TERMS OF CAPACITY AND engagement, although many still struggle to grasp the concept of the blue economy in Seychelles, work is being done to improve this. There are projects underway to integrate ocean literacy into the school curriculum and various NGOs work with communities and youth to advance ocean stewardship.

The Department of Blue Economy was established in 2015 and has retained a position of prominence within government (Benzaken & Hoareau, 2021). Various work has been done by Seychelles (in collaboration with international partners) since the Rio+20 Conference in 2012 to develop the *Seychelles Blue Economy Strategic Policy Framework and Roadmap 2018–2030*. The Roadmap was developed to guide action across government, private sector, and civil society, with a Blue Economy Action Plan developed in 2020 to advance action related to the Roadmap (Benzaken & Hoareau, 2021). Work has also been done to pilot a Blue Economy Valuation Toolkit. SeyCCAT and the MSP development process, which is underpinned by an Ecosystem-based Approach (Seychelles Marine

Spatial Plan, 2022), have engaged in multisectoral collaboration to guide and operationalize development, both with the potential to support adaptive management. Seychelles has considered the development of an Ocean Authority to support the operationalization of the MSP, integrated ocean management, and ocean governance to enable a more sustainable ocean economy (Benzaken & Hoareau, 2021).

In March 2015, the University of Seychelles (a young university, and the only one in Seychelles) established its first research institute—the Blue Economy Research Institute (BERI). BERI was developed to support research relating to environmental science, specifically the blue economy (and supporting integrated and adaptive ocean management) (Hoareau, 2022). In the absence of a national research strategy, SeyCCAT and BERI (along with other government and non-governmental partners) have guided strategic blue economy research development and facilitated various scientific support for decision-making and ocean literacy. This has enabled meaningful engagement, building credible and legitimate partnerships between scientists, policymakers, and the wider local and investment community. Various other projects have also evolved from these partnerships to attract funding and support components of integrated ocean management and development support, e.g., building on the development of the Seychelles Coastal Management Plan with related coral rehabilitation and nature-based solutions projects (e.g., blue barriers which combine engineering with rehabilitating coral reef systems). The Nationally Determined Contributions

have been revised to include the blue economy and coastal adaptation. Collaborative expedition research has allowed Seychelles-based scientists to access the deep sea and conduct research in areas previously unexplored while enabling peer-to-peer learning, laboratory upgrades, and access to high-tech scientific equipment, e.g., the Nekton Mission and Monaco Explorations.

In terms of capacity and engagement, although many still struggle to grasp the concept of the blue economy in Seychelles, work is being done to improve this. There are projects underway to integrate ocean literacy into the school curriculum and various NGOs work with communities and youth to advance ocean stewardship. A perception survey of ocean governance, fisheries management, and blue economy forms part of the SWIOFish3 Project. Blue economy youth engagement and advocacy are facilitated by young ocean leaders and the SIDS Youth AIMS Hub–Seychelles, for example. Diverse work is being done by the government’s national science and technology institute to advance national research development and they are aiming to support local entrepreneurs through a business, technology, and innovation incubator. SeyCAT has enabled projects like this that empower youth and women and advance blue business. This allows opportunities for investors, policymakers, and managers to be visualized, gaining more buy-in.

Although there is a clear set of actions underway to advance the blue economy in Seychelles, a more strategic and integrated knowledge system has the potential to link knowledge to action for sustainability more directly. A fragmented knowledge system leads to missed opportunities and weaknesses in decision-making. It does not allow for data to be accurately gathered and effectively communicated in a way that supports impactful and integrated ocean management.

CONCLUSION

Global governance initiatives aimed at advancing sustainability through the lens of sustainable development have evolved since the establishment of the principles of the Rio Declaration on Environment and Development. Recognition of the importance of ‘greening’ the economy, whether land-based or ocean-based (or a combination of the two), has led to global solution building, with the SDGs recognizing the influence of social-ecological relationships on sustainable development. SIDS have a clear interest in the establishment of a blue economy framework to manage their large ocean states and ensure island resilience as ocean-based sustainable development plans evolve.

Knowledge co-production at a global governance level can facilitate the evolution of effective localized blue economy frameworks that are inclusive, but local knowledge systems play a vital role in integrating sustainability and ensuring it is embedded within the community. A key element relates to capacity development within countries, ensuring that strategic initiatives are supported by commitments to communi-

ty engagement and development. A vital first step is recognizing the opportunities through knowledge co-production and building on community interests. As discussed in this paper, establishing a blue economy strategy or policy framework is a vital first step in making the ocean economy more sustainable, but strengthening the knowledge system plays a crucial role in making the vision a reality.

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