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CAPITALIZING ON CO-BENEFITS AND SYNERGIES TO PROMOTE THE BLUE ECONOMY IN ASIA AND THE PACIFIC

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Abstract

A blue economy has become a pivotal policy objective to promote sustainable development through the conservation and sustainable use of marine and coastal resources. An approach to promote co-benefits and synergies is useful for a wide range of stakeholders. To articulate such co-benefits and synergies, the authors chose cases for analysis based on the co-benefits and synergies in the promotion of a sustainable blue economy. They performed a socio-ecological system analysis to examine the interface of marine and coastal ecosystem changes and the policy and institutional responses. In the analyzed cases, the study identified a sound policy framework, multi-stakeholder and cross-sectoral collaboration, innovation, and science-based policy development and implementation as factors that catalyzed co-benefits and synergies. On the other hand, market disruption, changes in the marine environment, and climate change impacts impeded the efforts to promote a blue economy. The results of the analysis demonstrated that capacity development and international partnership are indispensable to promote a blue economy and scale up this effort. The analysis also inferred that research institutes can play a role in providing policy options and courses of action to assess the locally available resources and pursue co-benefits and synergies through the conservation and sustainable use of marine and coastal resources with the aim of achieving a sustainable blue economy.

Keywords: blue economy, co-benefit, synergies, trade-offs, innovation, partnership

JEL Classification: Q

Contents

1. INTRODUCTION

The blue economy has grown in importance in policy discourse as a way to promote sustainable development. Research has often used the term "blue economy" interchangeably with the term "ocean-based economy." Both cover a wide range of sectors related to the ocean and coasts, but the blue economy underlines the conservation and sustainability of marine and coastal ecosystems in the long term (Howard 2018; The Economist Group 2020). There have been a number of attempts to valuate and measure blue economy sectors (Mcllgorm 2016). Conservation and sustainable use of the ocean and marine resources are a pivotal principle of a sustainable blue economy, and the optimization of ocean use and the mitigation of conflicts remain vital (Jouffray et al. 2020). The policy discourse on sustainability and ecosystem services, particularly regarding the marine and coastal environment, underpins the sustainability dimension of the blue economy (Mulazzani and Malorgio 2017). In addition to the sustainability of the ocean environment and marine resources, the sustainable blue economy must improve human well-being and social equity (Pauly 2018; Nash et al. 2020). There is growing recognition that the sustainable blue economy can act as a vehicle to promote ocean resource-based development that is socially equitable, environmentally sustainable, and economically viable (Cisneros-Montemayor et al. 2019).

A sustainable blue economy is an important policy objective in Asia and the Pacific as there are many coastal, archipelago, and island countries and economies, and they have sustained the robust global economic growth over the past decade. The development of the blue economy is an important driver of economic growth in Asia and the Pacific (Bhattacharya and Dash 2020). To support a sustainable blue economy, the Asian Development Bank launched a healthy ocean action plan, worth USD5 billion dollars, with four focus areas: (i) creating inclusive livelihoods and business opportunities in sustainable tourism and fisheries; (ii) protecting and restoring coastal and marine ecosystems and key rivers; (iii) reducing land-based sources of marine pollution, including plastics, wastewater, and agricultural runoff; and (iv) improving sustainability in port and coastal infrastructure development (Asian Development Bank 2019). The economies of Asia and the Pacific, however, have contracted as a result of COVID-19. Despite the struggles in 2020, the prospect for recovery of economies in Asia and the Pacific turned out to be promising compared with that of other regions as the projected growth rate for 2021 is 7.4% for East Asia and the Pacific and 3.3% for South Asia (World Bank 2021). The spread of COVID-19 and its containment measures continue to be an important factor for the economic recovery in Asia and the Pacific. The expectation is that, as countries relax the containment measures, mobility and economic activities will resume, although sub-regional variations are possible (Asian Development Bank 2020). Countries in the Asia and Pacific region need to contain COVID-19 and reinforce their efforts to capitalize on the potential of the sustainable blue economy through conservation and sustainable use of the ocean and marine resources.

A sustainable blue economy relies on conservation and sustainable use of the ocean and marine resources, and these are concrete policy goals in the United Nations Sustainable Development Goals (SDGs), specifically Goal 14, entitled "Conserve and sustainably use the oceans, seas and marine resources for sustainable development" (SDG14: Life below Water) (United Nations 2015). There are 17 SDGs that focus on sectoral issues. SDG14 has 10 targets that specify concrete thematic policy goals. To achieve myriad policy targets across the SDGs, it is essential to build on the interlinkages and interactions among the SDGs and promote the implementation of

policy measures through an integrated, coherent, and indivisible framework (Hegre et al. 2020). It is necessary to generate synergies while restraining or optimizing trade-offs by assessing the risks and benefits (Fader et al. 2018). The ocean involves multi-faceted dimensions of the biosphere and human development, such as food, ecosystems, poverty, hunger, and gender equity, and the development of strategies for generating synergies and optimizing trade-offs within SDG14 is particularly important in the light of the inherent difficulties in comprehending the state of the marine and coastal environment and resources, the urgency of improving ocean health, the rapid growth of the blue economy, and the need for multi-stakeholder partnerships (Nash et al. 2020). The patterns of synergies and trade-offs demonstrate that they are not generic but rather heterogenic, and it is important to understand them in the local and regional contexts (Neve and Sachs 2020). To facilitate the development and implementation of policies and strategies for a sustainable blue economy in Asia and the Pacific, it is therefore important to undertake and draw lessons from empirical studies on the interactions between the SDGs and provide perspectives in this respect. This paper intends to assess the enabling factors and their potential synergies and trade-offs in achieving a sustainable blue economy based on case studies in some of the countries in Asia and the Pacific and to present useful perspectives for devising and implementing strategies for a sustainable blue economy in Asia and the Pacific.

2. DEVELOPMENT OF INTERNATIONAL POLICY DISCOURSES ON A SUSTAINABLE BLUE ECONOMY

The term “blue economy” arose in the process of the United Nations Conference on Sustainable Development in 2012. There was a strong call to boost the efforts to scale up ecosystem-based integrated coastal management and increase investment in the blue economy (Cicin-Sain et al. 2011). The outcome document of the 2012 Conference, “The Future We Want,” did not include a direct reference to a blue or ocean economy. However, it did include a reference to the importance of the conservation and sustainable use of the oceans and seas and of their resources for sustainable development and the importance of building the capacity of developing countries to benefit from the conservation and sustainable use of the oceans and seas and their resources (United Nations 2012).

SDG14 does not refer directly to the blue economy. However, it stipulates the key components of the blue economy with goals such as sustainably managing and protecting marine and coastal ecosystems (14.2), effectively regulating harvesting and ending overfishing, illegal, unreported, and unregulated fishing, and destructive fishing practices (14.4), prohibiting certain forms of fisheries subsidies that contribute to overcapacity and overfishing (14.6), increasing the economic benefits for small island developing states and least developed countries from the sustainable use of marine resources (14.7), and providing access to marine resources and markets for small-scale artisanal fishers (14.b). The direct reference to the blue economy appeared in the outcome document of the 2017 UN Ocean Conference entitled “Our Ocean, Our Future: Call for Action” (United Nations 2017). In the document, leaders recognized that the ocean contributes to sustainable development and sustainable ocean-based economies and called on all stakeholders to conserve and use the oceans, seas, and marine resources sustainably through actions including the promotion and strengthening of sustainable ocean-based economies, such as fisheries, tourism, aquaculture, maritime transportation, renewable energies, marine biotechnology, and seawater desalination, in paras. 3 and 13(q).

At the Global Sustainable Blue Economy Conference held in Nairobi, Kenya, in November 2018, the leaders adopted the Nairobi Statement of Intent on Advancing a Sustainable Blue Economy, which called for actions to promote blue economy strategies (Government of Kenya 2018). The High-Level Panel for a Sustainable Ocean Economy, which was an initiative of the Government of Norway and consisted of 14 heads of states and governments, launched a document on policy recommendations entitled "Transformations for a Sustainable Ocean Economy" in December 2020 (High Level Panel for a Sustainable Ocean Economy 2020). The document presented 74 actions in five categories, namely ocean wealth, ocean health, ocean equity, ocean knowledge, and ocean finance. In the document, 14 leaders affirmed their commitment to the sustainable management of 100% of the ocean area by 2025 as a way to promote a sustainable blue economy. The document called for actions including, for instance, actions to restore and harvest fish stocks at sustainable levels (sustainable ocean food), to develop ocean-based renewable energy as a fast-growing industry and a leading source of energy (sustainable ocean energy), to make coastal and ocean-based tourism sustainable and resilient (sustainable ocean-based tourism), and to conserve marine and coastal ecosystems, enabling them to be healthy, resilient, and productive (protect and restore marine and coastal ecosystems).

To explore effective blue economy strategies, it is important to understand the interface of various sectors and factors, such as fisheries, renewable energies, tourism, and marine and coastal ecosystem conservation, as they interplay to create synergies in the implementation of sector-specific policies and actions while at the same time involving trade-offs. Other factors can influence the activities aiming to achieve a sustainable blue economy, such as climate change and the pandemic. It is necessary to assess the socio-economic and biophysical aspects of marine and coastal resource use in local and regional contexts as well to promote synergies and optimize trade-offs in the pursuit of a sustainable blue economy in Asia and the Pacific.

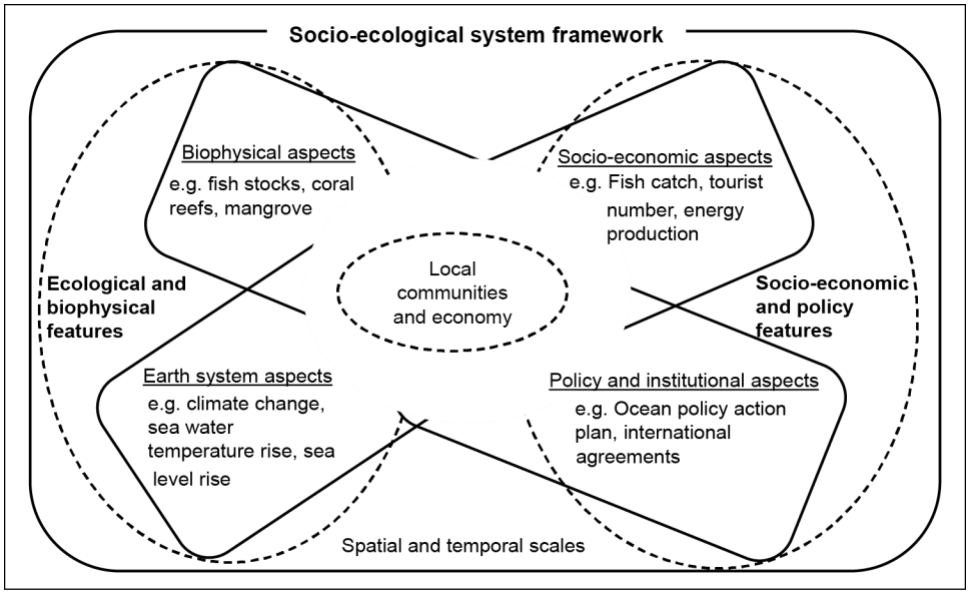
3. METHOD

To examine the interface of marine ecosystems and various sectors in the efforts to promote a blue economy, the authors chose cases according to the degree of co-benefits and synergies in the promotion of a blue economy. They chose five cases in Japan, one case in the Philippines, and one case in the Republic of Palau for the case study, and this paper presents the results of the case study analyses. The cases were mainly at the local level, while the case of Palau was national. However, its economy and population size are equivalent to the municipalities of the other two countries. The analyses intended to reveal the enabling conditions and factors and the challenges involved in the pursuit of a sustainable blue economy.

To conduct the case studies, the authors applied a socio-ecological system framework. The framework aimed to analyze the interactions between ecological systems and the social–political–economic settings that govern the management of natural resources and ecosystems (McGinnis and Ostrom 2014; Martínez-Fernández et al. 2021). The study also intended to examine the effects of changes in socio-ecological systems on social aspects such as food security, livelihoods, jobs, and income in coastal communities (Jara et al. 2020). The framework aimed to elucidate the factors that drive the changes in socio-ecological systems, which are complex in marine and coastal zones, and external pressures, such as climate change, can affect them (Tuda et al. 2020). It also intended to articulate the institutional framework for decision making, resource management, and stakeholder interactions that may enable or limit the adaptive governance of socio-ecological systems. When analyzing marine and coastal

socio-ecological systems, it is important to consider the interconnectedness of land, coast, and marine systems (Lauerburg et al. 2020).

Figure 1: Socio-ecological System Framework



Source: Author's development from Berrouet, L. M, 2018 and Martínez-Fernández, J. et al. 2021.

A full data set, which is necessary for thorough analysis under the socio-ecological system, is not available. Nonetheless, by applying the framework, the study intended to examine the synergies and trade-offs across socio-ecological systems in non-linear and multi-directional processes that require analysis on the spatial and temporal scales (Berrouet et al. 2018; Núñez-Regueiro et al. 2020; Rosellon-Druker et al. 2020). Figure 1 presents the illustrative conceptual flow of the analysis method that this paper adopted. It applied this concept to the subsequent case studies, and the analyses mainly concerned (i) policy and institutional aspects, (ii) business activities, (iii) marine and coastal environment changes, and (iv) climate change.

4. OPPORTUNITIES AND CHALLENGES FOR A SUSTAINABLE BLUE ECONOMY IN ASIA AND THE PACIFIC

4.1 Japan

4.1.1 National Policies for Managing the Ocean

Japan is an archipelago country located in the Northwest Pacific. It consists of four main islands and over 6,800 large and small islands, of which 400 have inhabitants (Ministry of the Environment, Japan 2014). Japan has the world's sixth-largest exclusive economic zone (EEZ). The areas that constitute Japan's territorial waters and EEZ comprise about 44,470,000 km2. Japan has diverse ecosystems with long indented coastlines of about 35,000 km, a length equivalent to seven-eighths of the earth's circumference. The protected coastal and marine areas, previously 8.3%, increased to 13.3% as of 1 January 2021 with the designation of four additional marine

areas as protected areas in the ordinance that Japan's Minister for the Environment released on 3 December 2020 (Ministry of the Environment, Japan 2020).

The Government of Japan enacted the Basic Act on Ocean Policy in 2007. The Act states that its intention is to stipulate the basic principles of Japan's ocean policy and the responsibility of the national government, local governments, businesses, and citizens to promote the peaceful and proactive development and use of the ocean and the conservation of the marine environment in pursuance of the United Nations Convention on the Law of the Sea (UNCLOS) and in international partnerships (Cabinet Office, Japan 2007). The Act also stipulates the establishment of the Headquarters for Ocean Policy, of which the Prime Minister serves as the Director-General (Articles 29, 31–2). Furthermore, the Act requires the Government to formulate a basic plan for ocean policy and the Prime Minister to seek a cabinet decision on the draft of the Basic Plan, which the government will review and amend about every 5 years (Article 16). The Act provides that the Headquarters shall draft and implement the Basic Plan on Ocean Policy (Article 30). It sets a policy framework to address ocean issues comprehensively and promote the planning of measures and activities necessary for integrated ocean governance (Terashima 2012). Accordingly, the government adopted the Basic Plan on Ocean Policy in 2008 and thereafter revised it in 2013 and 2018. Table 1 presents the thematic focus of the Act and the Basic Plan.

Table 1: Major Policy Thematic Measures in Japan's Ocean Policy

Major Policy Thematic Measures	Basic Act on Ocean Policy 2007	Basic Plan on Ocean Policy 2008	Basic Plan on Ocean Policy II 2013	Basic Plan on Ocean Policy III 2018
Ocean development and use	1	1	1	1
Marine environment conservation	1	1	1	1
Promotion of development in the exclusive economic zone	1	1	1	1
Securing maritime transport	1	1	1	1
Securing safety and security on the ocean	1	1	1	1
Promotion of ocean research	1	1	1	1
Promotion of research and development of ocean science and technology	1	1	1	1
Promotion of ocean industries and strengthening of international competitiveness	1	1	1	1
Fishery resource management and fishery sector revitalization				1
Comprehensive ocean governance	1		1	
Integrated coastal zone management	1	1	1	1
Remote island conservation and security	1	1	1	1
Disaster reduction and reconstruction			1	
Arctic			1	1
Promotion of international partnerships and cooperation	1	1	1	1
Development of the international order				1
Awareness raising among citizens of the ocean and human resource development	1	1	1	1
Documentation and information dissemination	1		1	
Information consolidation			1	
Maritime domain awareness				1

Source: Authors' development using information from the Cabinet Office, Government of Japan.

The Basic Plan continuously addresses core issues, such as ocean development and use, marine environment conservation, ocean research, ocean science technology, integrated coastal zone management, awareness raising, and human resource development. There was some development in specific issues, such as the arctic policy and the maritime awareness domain in the Basic Plan III of 2018. The government also inserted an explicit and elaborated reference into the Basic Plan III in connection with fishery resource management and the revitalization of the fishery sector. It also referred to the international order in the use of oceans. The updates of the Basic Plan involve the development of national and international situations and policy priorities. The term “ocean or blue economy” does not necessarily appear in the Act or the Plan except for the use of the phrase in the context of the prospect for economic activities in the Arctic. Nonetheless, there are a number of references to marine tourism, the ocean industry, and fisheries. Both the Act and the Plan thus cover the elements of the blue economy despite the absence of direct references.

Figure 2: Case Study Sites in Japan

Top left photo: Kelp harvesting in Erimo, Hokkaido (photo by Erimo Fishery Association). *Clockwise from top center photo*: Oyster farming in Minamisanriku, Miyagi; seaweed restoration in Hinase, Okayama; deep seawater application to prawn aquaculture in Kumejima, Okinawa; mangrove conservation and ecotourism in Okinawa (photos by Masanori Kobayashi).

4.1.2 Taketomi, Okinawa

Taketomi Town is located in Southwest Japan, forming part of Okinawa Prefecture. It is about 200 km south of Naha, the capital city of Okinawa Prefecture (Figure 2). It consists of seven inhabited islands and nine uninhabited islands with a semi-tropical climate. The population of Taketomi Town remains unchanged, with a slight increase from about 4,100 in 2010 to 4,300 in 2020. The annual economic production was an estimated JPY16 billion (USD155 million) in 2015, of which 72% was from the service sector, 20% was from the manufacturing sector, and 8% was from the primary sector. With respect to the employment ratio, the service sector engages 73% of workers, the

primary sector accounts for 14%, and the manufacturing sector has 5%; 9% work in multiple sectors. In the local economy, tourism is a leading industry.[1]

Following the adoption of the National Basic Act on Ocean Policy and the Basic Plan on Ocean Policy, Taketomi Town adopted its own local plan for ocean policy in 2011. The Plan recognizes the importance of the nature and culture that Taketomi Town harnesses. It also underlines the role that Taketomi Town plays in science, monitoring, and observation regarding the marine environment, biodiversity, astronomy, renewable energy, and marine and seabed resources (Taketomi Town 2011). The Plan, in its annex, lists 23 action points, which include, for instance, marine onshore debris management, rulemaking for eco-tourism, and resource mobilization for environmental conservation. The town revised the Plan in 2018 with an emphasis on multi-stakeholder partnerships and a plan–do–check–action (PDCA) cycle approach. The Plan also proposes to establish a local consultative council and introduce a third-party evaluation process (Taketomi Town 2018a).

There are other policy initiatives that complement the Basic Plan. Taketomi Town made a "Taketomi Town Tourism Promotion Declaration" in 2010 and adopted its Basic Plan on Tourism Promotion in 2012, which it revised in 2018 (Taketomi Town 2018b). Taketomi Town has undertaken campaigns to promote tourism and facilitated partnerships among travel agents, hotels, and eco-tour operators. The tourists who visit Taketomi Town are largely interested in beaches, marine leisure, nature, and wildlife. Thus, nature conservation is a key strategy to boost the number of tourists visiting Taketomi Town.

Iriomote Island of Taketomi Town is renowned for its nature and wildlife and is part of Japan's Iriomote-Ishigaki National Park. A total of 80% of Iriomote Island is a nationally owned forest, and the majority of the island received designation as a national park in 1972.[2] It is at the northern threshold of mangrove forests and is the habitat of over seven mangrove species (Uchiyama and Miyagi 2020). Mangrove deforestation was prevalent in the 1940s. However, thereafter, man-made deforestation ceased, and mangrove recovery has taken place over the past decades. The mangrove coverage of Iriomote Island grew 1.4 times from 430 ha in 1961 to 610 ha in 2007 (Okinawa Prefecture 2015). Iriomote Island is home to the largest mangrove forests in Japan. The promotion of mangrove conservation, which Taketomi Town's Basic Plan identified as a priority, has occurred as the national parks program of the Ministry of the Environment, Japan, has institutionalized and reinforced conservation activities. While the coverage of mangroves has been expanding over the past decades, there have been occasional incidents of massive destruction as a result of fierce typhoons that hit Iriomote Island in 2006, 2007, and 2015. Due to the increase in the velocity of typhoons, they destroyed 4.3 ha of mangrove areas, felling about 2,000 mangrove trees and ripping off topsoil.[3] Iriomote Island is also home to the largest areas of coral reefs, with over 400 species. Some coral reef areas gained designation as underwater parks in 1977. They stretch for 20 km from west to east and 15 km from north to south in the sea areas under the jurisdiction of Taketomi Town. However, in 2016, there was a report that coral bleaching had occurred in 91.4% of the areas in December 2016, which reduced to 49.9% in December 2017 (Ministry of the Environment, Japan 2018). The seawater temperature was 1–2°C higher throughout 2016 than in 2017. The status

[1] Information from the Taketomi Town Government (in Japanese). Accessed on 3 January 2021. https://www.town.taketomi.lg.jp/administration/toukei/.

[2] Ministry of the Environment, Japan. Iriomote-Ishigaki National Park. Accessed on 3 January 2021. https://www.env.go.jp/park/iriomote/point/index.html.

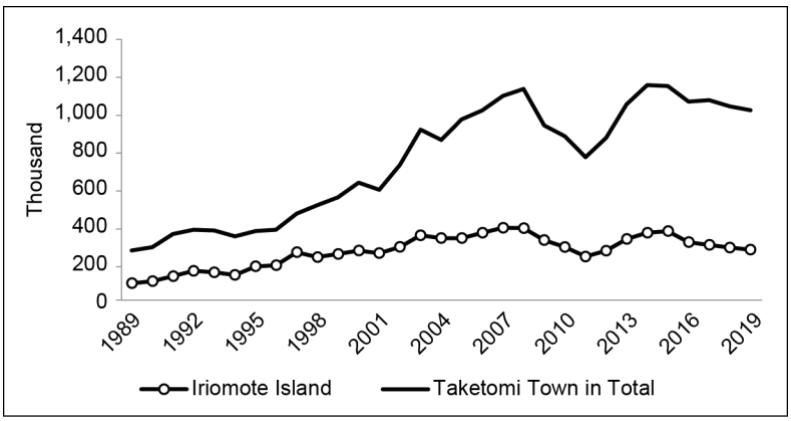
[3] There is no report on the regrowth of the destroyed mangrove areas (Uchiyama and Miyagi 2020).

of coral reefs, including bleaching, needs continuous monitoring, and the causes of bleaching require further examination.

The tourist arrivals to Taketomi Town grew from 286,000 in 1989 to 1,026,000 in 2019, an increase of 3.59 times in the past 30 years (Figure 3). There was a fall in the number of tourists visiting Taketomi Town in the 2009–2012 period due to the Leman Shock in 2008, the swine flu pandemic in 2009, and the Great East Japan Disaster in 2001. Thereafter, a resurgence in the number of tourists took place in 2013. A big factor was the opening of a new airport on Ishigaki Island in 2013, adjacent to the islands of Taketomi Town. A low-cost carrier started services from Osaka and Tokyo. The new Ishigaki Airport has become a gateway for tourists to visit Taketomi Town. The number of tourists visiting Taketomi Town started declining from 1,154,000 in 2015 to 1,026,000, a 11.1% reduction rate during the 2015–2019 period. A worrisome factor is the 25.2% reduction in the number of tourists visiting Iriomote Island, which declined from 388,000 in 2015 to 290,000 in 2019. Infrastructure development and airline services could boost tourism, but unexpected shocks, such as economic crisis, pandemics, and disasters, could adversely affect it.

Data on the number of sea kayakers are not available. Nonetheless, the data on the number of eco-tourism tour operators and guides on Iriomote Island show an interesting trend. The number of eco-tourism operators grew from 19 in 2000 to 67 in 2014 (Ministry of the Environment Kyushu Regional Office 2016). The number of tour guides also expanded from 43 in 2000 to 136 in 2014. The increase in the number of eco-tour operators and guides was more than three times that in the 2000–2014 period. On the other hand, the data on the location of accommodation for tourists visiting Taketomi Town revealed that 70% of them stay in accommodation in Ishigaki City; 20% stay on the islands of Taketomi Town; and 10% stay in both Ishigaki City and Taketomi Town. Likewise, 35.5% of tourists' expenditure on meals is in Taketomi Town and 66.5% is in Ishigaki City. Of tourists' expenditure on souvenir shopping, 28.6% is in Taketomi Town and 74.6% is in Ishigaki City. The increase in the number of tourists has not remained linear. The distribution of expenditure on accommodation, meals, and souvenirs does not favor the local economies in Taketomi Town.

Figure 3: The Number of Tourists Visiting Taketomi Town and Iriomote Island (1989–2019)



Source: Authors' development using the information from Taketomi Town at https://www.town.taketomi.lg.jp/administration/toukei/kankonyuiki/1531308472/.

It is worth noting that some distinctive developments have occurred in the implementation of the Basic Plan on Ocean Policy. With respect to the rulemaking to promote eco-tourism in harmony with the conservation of nature, Taketomi Town released a tour guide ordinance on 20 September 2019 (Taketomi Town 2019a). The ordinance introduced a license system according to which those who want to operate tours in Taketomi Town need to apply for and obtain a license from the mayor of Taketomi Town (Art. 8). The ordinance also provides the authority of the mayor to reject the application (Art. 8-5), the requirement for license renewal (Art. 12), the authority of the mayor to issue guidance and recommendations to tour operators (Art. 22), the authority of the mayor to request reports from tour operators and to inspect their offices (Art. 24), and the authority of the mayor to suspend the license of tour operators (Art. 25).

In connection with resource mobilization, Taketomi Town introduced a system to invite tourists to make financial contributions to support nature conservation in Taketomi Town in September 2019 (Taketomi Town 2019b). The payment is JPY300 (USD2.89) per person and is voluntary, not obligatory. It introduced this system in accordance with the national act entitled the "Local Nature Asset Act" of 2014, which allows local authorities to receive payments on the grounds of protecting nature in line with the nature conservation plan that a consultative council will develop. Local authorities can use the revenue to obtain land as a nature trust.[4] The impacts of the ordinance and island entry payment system require further monitoring and examination.

4.1.3 Minamisanriku, Miyagi

Minamisanriku Town is located in Miyagi Prefecture in Northeast Japan. It faces the Pacific Ocean with a deeply indented rias coastline. The population is about 12,800, and the economic production is worth JPY93.47 billion (USD900 million). The manufacturing sector accounts for 71.0%, the service sector represents 23.8%, and the primary sector constitutes 5.2%. The economic production of the fishery and aquaculture sector is JPY4.17 billion (USD40.3 million), which accounts for 4.5% of the total economic production. The fishery and aquaculture activities are mainly aquaculture of oysters, kelp, and koho salmon and gillnet fishing. As of 2019, Minamisanriku had registered 505 fishery enterprises (Minamisanriku Town 2020). The 2011 Great East Japan tsunami disaster devastated Minamisanriku, inundating 1,145 ha, about 7% of the total land area, where about 4,600 households with a population of 15,000 resided at the time of the disaster. The death toll rose to 444, with 349 missing. The total number of evacuees was 9,753, which accounted for 55.2% of the population at that time (Minamisanriku Town 2012).

Oyster farmers in Shizugawa Bay, Minamisanriku, also suffered enormous damage due to the 2011 tsunami. In Shizugawa Bay, the economic production of fisheries and aquaculture was worth JPY2.3 billion or USD22.2 million. Estimations indicated that, in the 2011 disaster, the damage to fisheries and aquaculture facilities was JPY1.15 billion or USD11.1 million (Miyagi Prefecture Fishery Cooperatives 2012).

The Shizugawa Bay division of the Fishery Cooperatives consists of two sub-divisions, namely Tokura District and Shizugawa District. In Tokura District, prior to the 2011 disaster, 88 fishermen engaged in oyster farming and operated 3,000 units of oyster farming gears. This activity involves placing a wire lope below the sea surface, from which wire lopes about 5 meters long hang vertically with some scallop shells. The

[4] The government implemented the Act on 25 June 2014, and it came into effect on 1 April 2015 (Ministry of the Environment, Japan). http://www.env.go.jp/nature/national-trust/n- trust_law/index.html (accessed 3 January 2021).

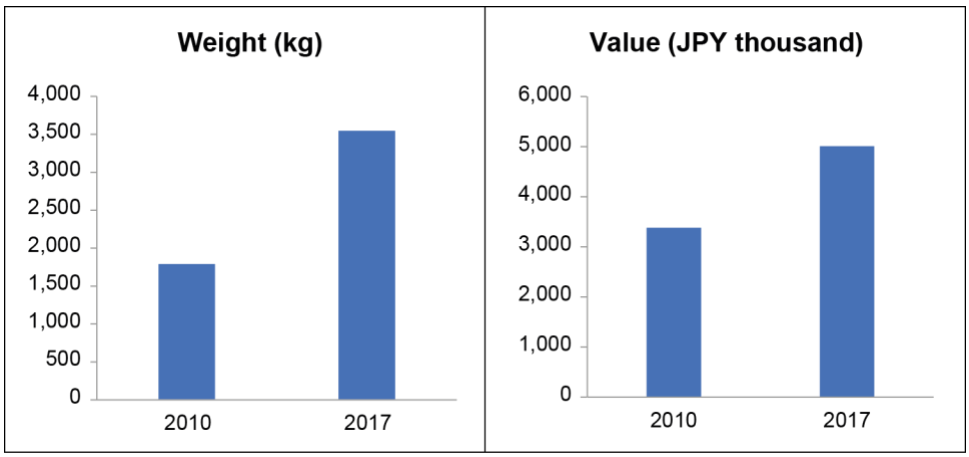
density of oyster farming was a concern prior to the disaster. With the destruction of all the oyster farming gears, some elderly farmers decided to abandon oyster farming. The remaining fishermen started to collaborate with WWF Japan and university professors to assess the marine environment conditions immediately after the disaster. After long discussions among the oyster farmers, they reached an agreement to restore the oyster farming gears not to the pre-disaster level but to one-third of the pre-disaster level (Goto 2018).

The farmers accessed concessional funding to restore the oyster farming gears and resumed oyster farming. It turned out that the oyster growth improved with the reduced density of oyster farming and the improved nutrition circulation. It used to take 2–3 years for oysters to mature prior to the disaster, and now they mature in a year. As a result, despite the reduction in the oyster farming production capacity from 3,000 units in 2010 to 1,000 in 2017, the production volume per oyster farming enterprise almost doubled from 1.8 tons in 2010 to 3.5 tons in 2017. The production value per oyster farming enterprise also increased from JPY3.4 million in 2010 to 5 million in 2017.

There were also some social benefits. The reduction in the number of oyster farming gears resulted in fewer working hours, which decreased from 10 hours per day in 2010 to 6 hours per day in 2017. The increased revenue and reduced working hours increased the attractiveness of oyster farming as a job opportunity. The aging and declining fishing population was a concern prior to the disaster, when the number of oyster farmers declined from 88 in 2010 to 52 in 2018. However, there was a new entry of youths into oyster farming, and the number of oyster farmers below the age of 30 increased from 8 in 2010 to 18 in 2018.

Oyster farmers responded positively to WWF Japan's suggestion of applying for Aquaculture Sustainability Council (ASC) certification in 2014. They had to prepare documents and meet the requirements over 125 elements, such as legal compliance, environmental protection, and chemical management.

Figure 4: Oyster Production per Enterprise in Minamisanriku, Miyagi, Japan (2010–2017)



Source: Goto (2018).

The Tokura District branch of the Fishery Cooperatives was the first in Japan to receive an ASC certificate in March 2018. After obtaining their ASC certificates, oyster farmers opened a marketing channel to a large food retailor. ASC-certified oysters do not necessarily receive a premium price. However, the price erosion that used to happen toward the end of the harvesting season no longer occurs. The stability of retailing prices helps to sustain the revenue for oyster farmers.

The oyster farmers also supported the process of Shizugawa Bay for listing under the Ramsar Convention. Coastal and marine biodiversity assessment took place from 2017 to 2018 with the support of the Ministry of the Environment Tohoku Regional Office. The survey confirmed the presence of 208 species of seaweeds and seagrasses. Shizugawa Bay achieved a listing under the Ramsar Convention in October 2018 (Ramsar Site Information Service 2018). The Ministry of the Environment, Japan, opened a visitor center in Minamisanriku to exhibit local coastal and marine biodiversity to support the activities for experience-based nature learning. The oyster farmers feel proud of the international recognition of their oyster farming site and its use by schools and non-profit organizations (NPOs) for nature learning.

4.1.4 Hinase, Bizen, Okayama

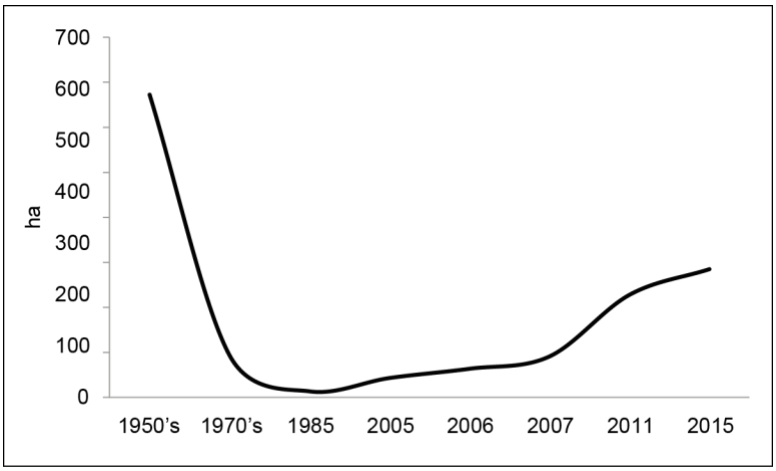
Hinase is located in Bizen City, Okayama Prefecture. Hinase faces Setonaikai or Seto Inland Sea. It has hilly and mountainous areas in the north and 13 islands and islets in the south and is home to 6,900 people. Coastal fishermen capture beam, squid, and crab and farm seaweed and oysters. The reduction of seagrass cover in the local sea area is likely to be among the reasons for the declining fishery productivity. The Hinase Fishery Cooperative has spearheaded the activities to restore the seagrass cover over the past decade. The seagrass cover reduced from 590 ha in the 1950s to 12 ha in 1985 (Figure 5). With the restoration work, it increased to 250 ha in 2015 (Tanaka 2017). Likewise, the seagrass cover across the coastal areas of Okayama Prefecture, which were an estimated 4,300 ha in 1925, plummeted to 549 in 1989 and rose to 1,221 ha in 2007 (Goto et al. 2015).

Multi-stakeholder partnership is one of the unique features of the activities to restore the seagrass beds in Hinase. The Hinase Fishery Cooperative collaborates with local junior high schools, and the students work with fishermen to place the bags of seagrass seeds in the sea and collect floating leaves of the seagrass. At the same time, an NPO helped students to document their conversations with local fishermen and prepare reports. By doing so, the students started demonstrating an improvement in their study scores. They also had useful opportunities to understand the local environment, economy, and stakeholders.

The collaboration that emerged through such activities led to the establishment of the Bizen City Satoyama-Satoumi Brand Promotion Council in 2017.[5] The Council provides a platform for promoting collaboration among fishery cooperatives, agriculture and forestry cooperatives, chambers of commerce, tourism associations, education commissions, research institutes, local governments, and NGOs.

[5] Satoyama is a Japanese term meaning a socio-ecologically productive landscape. Satoumi is a socio-ecologically productive seascape. They represent the notion of a sustainable relationship between humans and the environment.

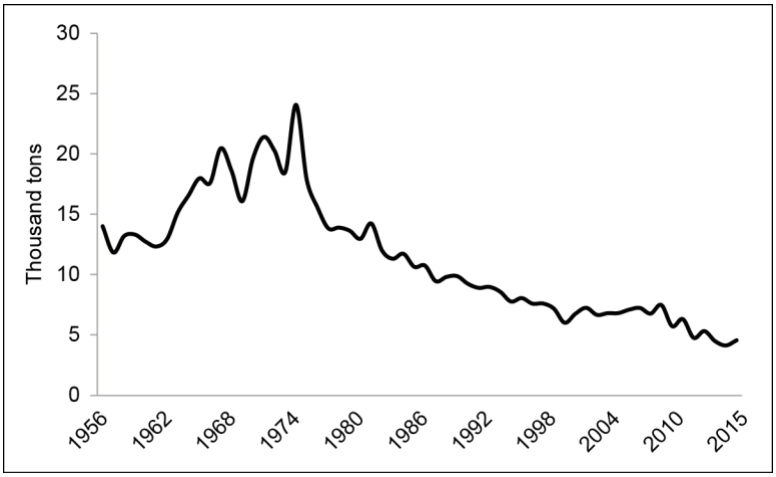
Figure 5: Changes in Seagrass Cover at its Peak in Areas of Hinase (1950s–2015)



Source: Developed from Tanaka (2017).

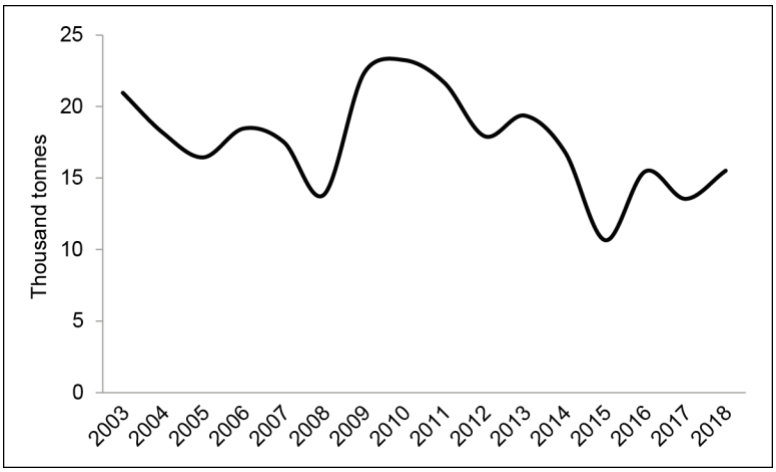
The restoration of seagrass beds has also reportedly restored the biomass volume of species such as beam, squid, and crab that inhabit the seagrass beds (Kakuma et al. 2018). Conversely, a biomass increase is not apparent from the statistics of fishery production as they show the catch volume and not the biomass present in the sea. The overall fishery production in Okayama Prefecture fell by 81% from 24,000 tons in 1974 to 4,500 tons in 2015. During the 1985–2015 period, a multiple-fold increase occurred in the seagrass coverage. However, the fishery production continued to fall by 57% from 10,000 tons in 1985 to 4,500 tons in 2015. In the 2000–2015 period, fishery production declined by 33% from 6,700 tons to 4,500 tons.

Figure 6: Long-Term Fishery Production in Okayama Prefecture (1956–2015)



Source: Authors' development using information from the Ministry of Internal Affairs and Communications, Japan (2020) at www.e-stat.go.jp.

Figure 7: Oyster Production in Okayama Prefecture (2003–2018)



Source: Authors' development using information from the Ministry of Internal Affairs and Communications, Japan (2020) at www.e-stat.go.jp.

On the other hand, the oyster production in Okayama prefecture is not necessarily following a downward linear trend. The oyster production reduced by 26% from 21,000 tons in 2003 to 15,500 tons in 2018. However, in the 2008–2018 period, the production rose from 13.8 tons in 2008 to 15,500 tons in 2018. There were periods when the oyster production increased from the previous year. While the total fishery production in Okayama Prefecture continues to fall, the fluctuating oyster production could be a positive sign of aquaculture productivity. In the Hinase area, Okayama, there is a belief that seagrass enhances the water quality, supporting oyster farming. Farmers use abandoned oyster shells to enhance the seabed soil fertility, encouraging seagrass growth (Tanaka 2014; Tanaka and Furukawa 2019). Further examinations of the mechanism of a potential virtuous cycle among seagrass, oyster farming, seawater quality, abandoned oyster shells, and marine and seabed biomass productivity are necessary.

4.1.5 Kumejima, Okinawa

Kumejima (Kume Island) is located 100 km west of the Okinawa main island. Kumejima's land area is 63.65km^2. Its population is 7,670, and 56.8% of the workforce is in the service sector, 27.7% is in the primary sector, and 15.5% is in the manufacturing sector (Kumejima Town 2015). The total economic production is worth JPY1.28 billion (USD12.34 million), of which 75.6% comes from the service sector, 15.7% from the manufacturing sector, and 8.7% from the primary sector.

Kumejima is known worldwide for its ocean thermal energy conversion (OTEC) facility, which in 2014 succeeded for the first time in the world in achieving continuous operation to generate power, with a generation capacity of 100 kW. OTEC involves turning a turbine through fluid, such as ammonia or hydrofluorocarbon, which warm surface seawater evaporates and cold deep seawater reliquefies. OTEC dates back to 1926, when experimentation took place in France. Thereafter, a number of countries experimented with it, including Cuba and Nauru (New Energy and Industrial Technology Development Organization (NEDO) 2010). The Natural Energy Laboratory of the Hawaii Authority (NELHA) completed the construction and started the operation of an OTEC facility in 2015, with power generation capacity of 105 kW, the largest in the world. The OTEC facility in Kumejima has the capacity to draw 13,000 tons of deep seawater per day from a depth of 612 meters and is the second largest next to the

NELHA's facility. OTEC provides 100 kw of power, equivalent to the power that 250 households use.

The operation of OTEC has revealed its collateral socio-economic benefits from the secondary or multiple use of deep seawater after power generation. Deep seawater has unique coolness, purity, and nourishment properties that are suitable for and beneficial to, for instance, shrimp/prawn and sea grape aquaculture, cosmetic and personal care production, and trophotherapy. The value of production that uses deep seawater from OTEC in Kumejima was an estimated JPY2.48 billion (USD22 million) in 2015, and it employed 140 persons (Cabinet Office, Japan 2017). It is possible to highlight a number of enabling factors.

Thorough preparation, including research and surveys, was necessary. The Okinawa Prefecture Ocean Science and Technology Basic Initiative incubated the concept of OTEC in 1986. It examined 25 potential sites for the location of OTEC, which it narrowed down to three sites in 1994. The establishment of the Okinawa Prefecture Deep Sea Water Research Center occurred in 2000. The extensive preparations ensured the effectiveness of OTEC's operations.

The multi-stakeholder collaboration is also a key feature. The Kumejima Town Office spearheaded a multi-stakeholder and cross-sectoral partnership with the support of the Okinawa Prefecture Government. The Kumejima Town Office established the Global Ocean Resource and Energy Association Institute as a consortium to promote OTEC in 2014.

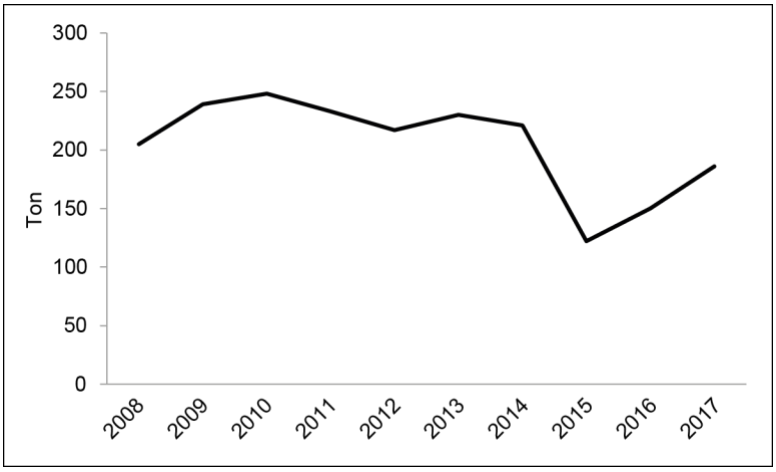
The funding was also critical. The national government and the Okinawa Prefecture government created a mechanism whereby the users of deep seawater for aquaculture, manufacturing, and leisure purposes pay fees in exchange for receiving deep seawater. Though the operation ceased temporarily at the time of tourism closure due to COVID-19 in 2020, a spa that used deep seawater and had thalassotherapy value offered a half-price entry fee to local residents. Tours for the public also take place for awareness raising, learning, and education. These factors have helped to increase the social acceptance of OTEC in Kumejima. People considered the secondary use of deep seawater as collateral at the initial stage. However, it has become a major driver of the expansion of OTEC's capacity, particularly in terms of extracting deep seawater. The collaboration between OTEC in Kumejima and HELHA has flourished, and the institutionalization of a growing partnership resulted, for instance, in the establishment of the Ocean Thermal Energy Association (OTEA) in October 2020 as an international coalition of scientists and experts to promote OTEC around the world.[6]

Shrimp or Kuruma prawn accounts for 47.7% of the total economic production based on the secondary use of deep seawater (Ikegami 2015). The volume of prawn aquaculture production was 248 tons in 2010 and fluctuated afterwards, falling to 122 tons in 2015 but rising to 186 tons in 2017 (Figure 8). The production volume did not necessarily show a linear upward trend. Data on the value of prawn production in Kumejiam are not available. A possible explanation for the fall in the production is that it is a consequence of prawn disease, and a possible explanation for the stagnation of the production is that the producers sell juvenile prawns to the mainland in Okinawa before they mature. Data on the market value of prawns are available on the Okinawa prefectural level, as Figure 9 shows. The prawn production declined from 652 tons in 2006 to 545 tons in 2012. It fluctuated thereafter and was 523 tons in 2017, a decrease

[6] The details of the Ocean Thermal Energy Association (OTEA) are available at http://www.ocean-thermal.org/about/ (accessed on 5 January 2021).

of 19.8% from the 2006 level. The production value fluctuated and was JPY2.67 billion (USD23.6 million) in 2017, which was 17.8% less than the JPY3.2 billion in 2006. With respect to the value/volume, it was JPY5.1 million per ton in 2017, which was 2.5% more than the JPY5.0 million per ton in 2006. Despite the prawn production volume and value decreasing by 17.8–19.8% in the 2006–2017 period, it is possible to interpret the increase in the value per production volume of 2.5% as an improvement in the prawn productivity. A further analysis of the prawn productivity is necessary throughout the supply chain from production and retailing to consumption. The economic returns to the prawn growers also require assessment based on the dynamic market conditions.

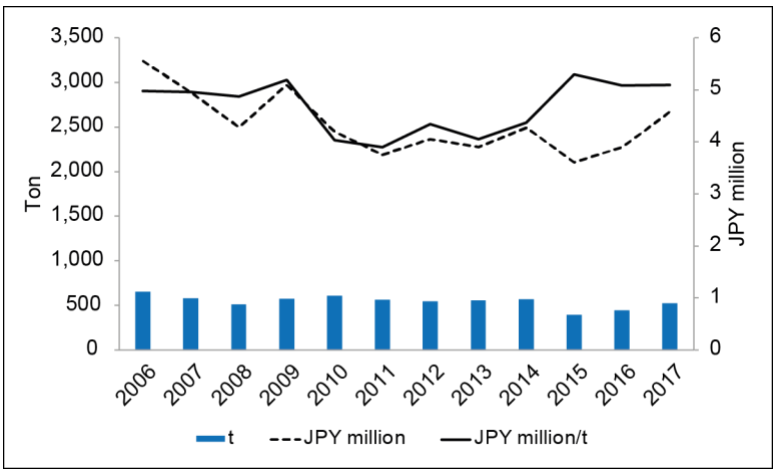
Figure 8: Prawn Aquaculture Production in Kumejima, Okinawa (2018–2017)



Note: The authors used mean imputation to construct the data for 2011.

Source: Authors' development using data from the Ministry of Internal Affairs and Communication, Japan at www.e-stat.go.jp.

Figure 9: Prawn Production in Okinawa (2006–2017)



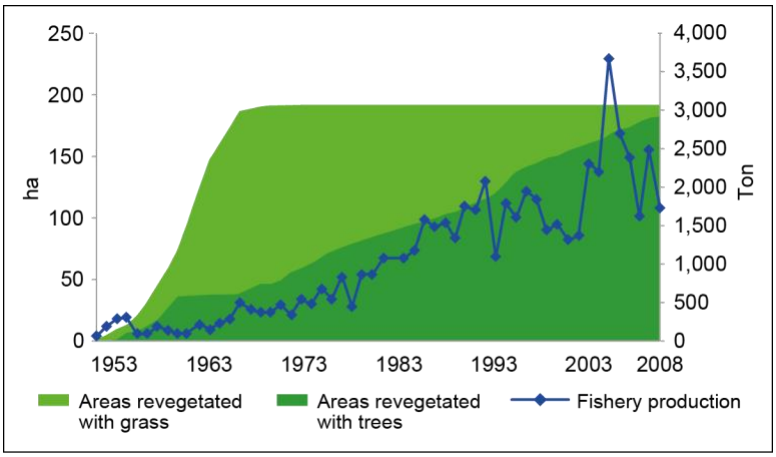
Source: Authors' development using information from Okinawa Prefecture at https://www.pref.okinawa.jp/site/norin/norinkikaku/kenkyu/documents/gaikyou52-58.pdf (accessed on 5 January 2021).

4.1.6 Erimo, Hokkaido

Erimo Town is located in Southeast Hokkaido, surrounded by nature. It bases its economy on fisheries and tourism. The total population is 4,500, and the workforce is 3,200, of which 48.6% works in the primary sector, 39.0% in the service sector, and 12.3% in the manufacturing sector.[7] The fisheries production in Erimo consists of mainly kelp and seaweed, cod, salmon and trout, and clams. Erimo faced stagnation of its fish production during the 1940s and 1950s. Local fishermen considered deforestation and soil erosion to be a major cause of the slump in fishery production. Soil particles falling into the seawater accumulated as sediment and undermined the habitat of the kelp, seaweed, and fish stocks. The local fishermen took initiatives to restore the land cover with vegetation and restoration in the 1950s. They reforested 3 ha of barren land in 1954. However, the survival rate of planted trees was not promising. In 1957, they introduced a system to use kelp and seaweed as organic fertilizer to enhance the soil nourishment. Thereafter, they started planting pine trees to arrest the soil erosion (Ministry of the Environment, Japan 2009). The Forestry Agency of Japan supported the reforestation activities and procured kelp and seagrass for use as soil nourishment. By 1970, it had reforested 192 ha in accordance with the reforestation plan.

There was a correlation between the increase in vegetation and reforested areas and the increase in fisheries production. The fisheries production started increasing in proportion with the revegetation and reforestation in Erimo (Figure 10). The revegetation with grass expanded faster than the reforestation. The soil erosion arrested in 1965, when the grass revegetation covered 80% of the targeted areas. The fishery production increased from 72 tons in 1952 to 2,264 tons in 2001. The case represents the virtuous correlation between the state of terrestrial ecosystems and the productivity in coastal and marine ecosystems.

Figure 10: Revegetation/Reforestation and Fisheries Production in Erimo (1953–2008)



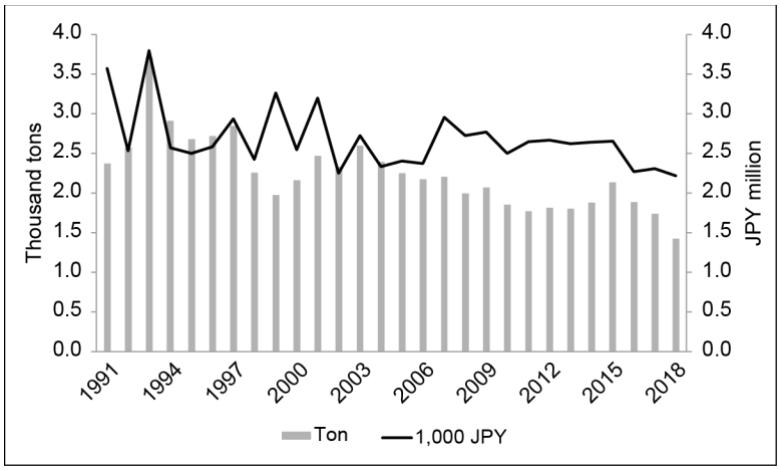
Source: Ministry of the Environment, Japan, 2009.

Kelp production in Erimo hit a peak of 3,700 tons in 1993 and then declined to 1,400 in 2018, a 61.4% reduction (Figure 11). The production value decreased from JPY3.8 billion (USD33.2 million) in 1993 to JPY 2.2 billion (USD 20.0 million) in 2018,

[7] The information on Erimo Town is available at https://www.town.erimo.lg.jp/ (accessed on 6 January 2021).

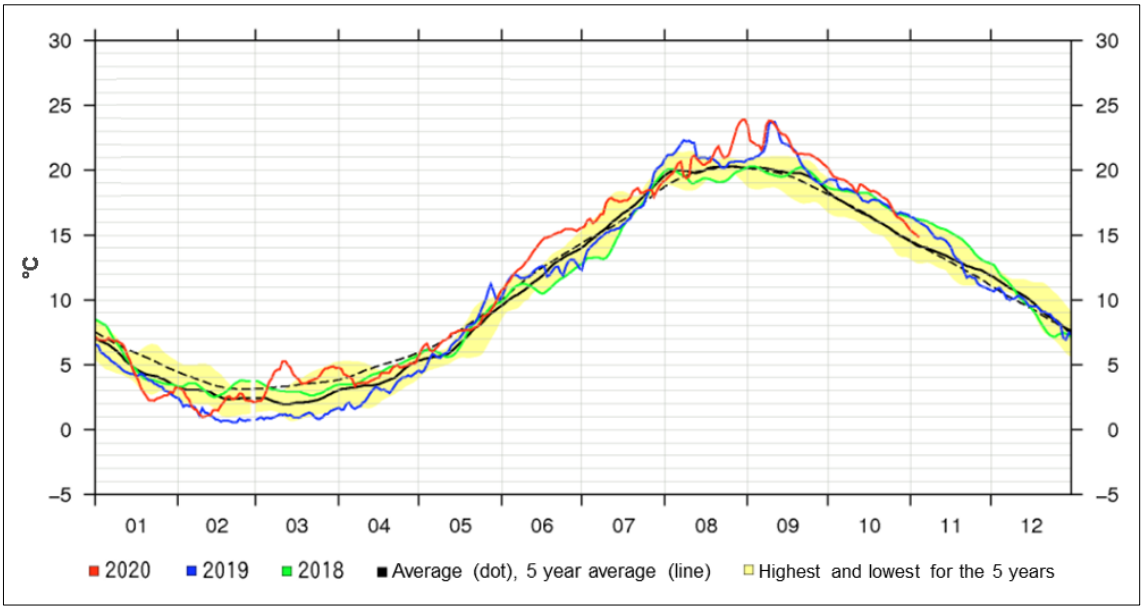
representing a 41.6% reduction. The reason for the reduction in kelp production is not the resurgence of soil erosion but presumably the increased seawater temperature. The Japan Meteorology Agency (2019) reported that the seawater temperature in the northern part of Hokkaido, where Erimo is located, has risen by 1.18 °C over the past century. There was a 5 °C difference between March 2019 and March 2020. The difference may be due to the current change, but it needs further verification. A high seawater temperature, particularly in winter, has been a notable phenomenon around Japan in recent years. Further research is necessary on the correlation between a poor kelp harvest and the seawater temperature rise in Erimo. The presence of other predatory species also needs verification.

Figure 11: Kelp Production in Erimo (1991–2018)



Source: Authors' development using data from Marinenet Hokkaido (2020) at http://www.fishexp.hro.or.jp.

Figure 12: Trend of the Seawater Temperature in the Eastern Part of Hokkaido (2018–2020)



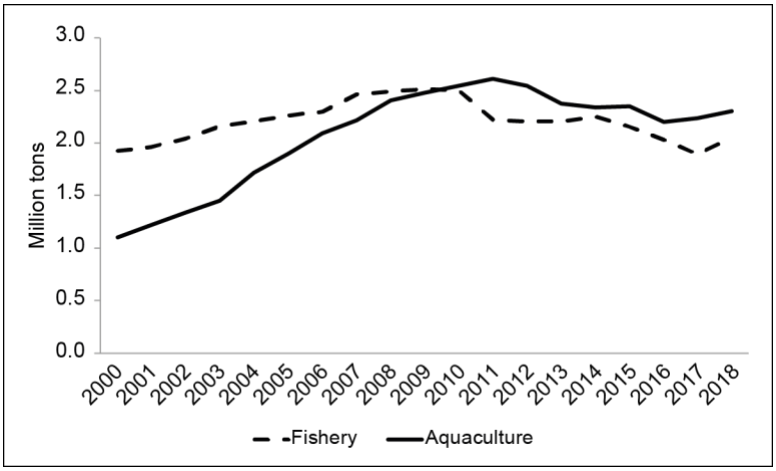
Source: Japan Meteorology Agency (2020) at www.data.jma.go.jp (accessed on 7 January 2021).

4.2 Quezon Province, the Philippines

The Philippines is an archipelago country in Southeast Asia. Fisheries and aquaculture are a vital part of the Philippine economy. A shift has occurred in fisheries and aquaculture in the Philippines as the linear upward trend in the fishery sector turned downward in 2010 and aquaculture surpassed fisheries (Figure 13). The fishery production was 1.9 million tons in 2000, reaching a peak of 2.5 million tons in 2010 and gradually declining to 2.1 tons in 2018. Conversely, aquaculture production was 1.1 tons in 2000 and hit a peak of 2.6 tons in 2011, fluctuating to 2.3 tons in 2018. During the 2000–2018 period, fisheries grew by only 6.9%, while aquaculture doubled, with a growth rate of 109%.

In Quezon province, 185 km southeast of Manila, fisheries and aquaculture are an important part of the local economy. The trend of declining fisheries and growing aquaculture is apparent in Quezon province as well. The total fisheries and aquaculture production grew by 40% over the 2000–2019 period in Quezon Province (Figure 13). Aquaculture expanded the most, with a growth rate of 214%. Municipal fisheries also grew by 134%. On the other hand, commercial fisheries reduced by 40% in the same period. It is arguable that the increase in aquaculture and municipal fisheries that caused the total 40% expansion in fisheries and aquaculture in the 2000–2019 period offset the decrease in the commercial fisheries.

Figure 13: Fisheries and Aquaculture Production of the Philippines from 2000 to 2018

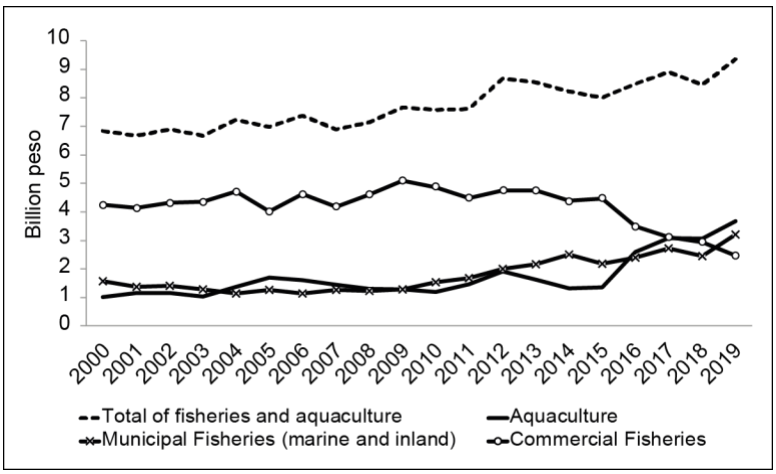


Source: Authors' development using data from the FAO at www.fao.org/fishery/statistics/software/fishstatj/en (accessed on 7 January 2021).

The expansion of aquaculture seems to have exerted further pressure on coastal and terrestrial ecosystems. As aquaculture ponds expanded, mangrove cover decreased. In the period 1970–1993, statistics showed that aquaculture ponds increased by 55.5%, while the mangrove coverage declined by 57% (Forest Management Bureau and Bureau of Fisheries and Aquatic Resources, Philippines 2021). There was an obvious correlation or trade-off. Another study indicated that the mangrove coverage in the Philippines fell from 269,000 in 1990 to 241,000 in 2010, with a 10.5% reduction (Long et al. 2014). In Quezon Province, the mangrove destruction occurred more rapidly than the national average. The mangrove coverage fell from 14,900 in 1990 to 14,200 in 2000, with a 5.0% reduction rate. However, it rose from 14,000 in 2000 to 14,400 in 2010, representing a 1.7% increase. As a result, the mangrove cover fell by

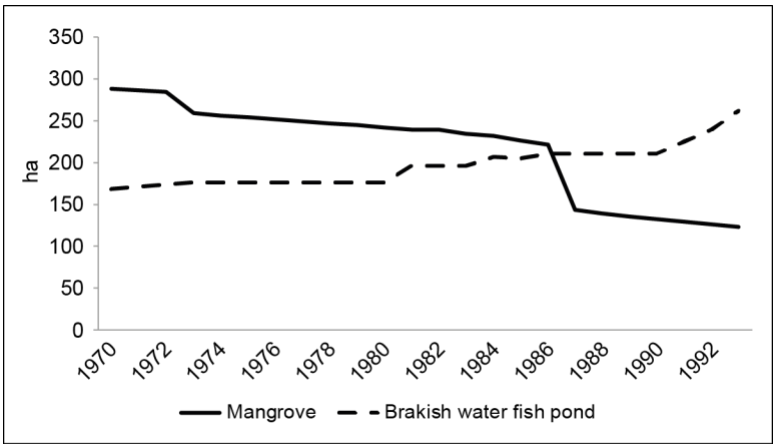
3.4% in the 1990–2010 period, a slightly lower reduction rate than the national average of 10.5%. In Pagbilao, Quezon Province, a 145 ha mangrove area became the Pagbilao Mangrove Experimental Forest in 1975. Nonetheless, the illegal conversion of mangrove forests into aquaculture fish ponds was a main driver of their destruction (Janssen and Padilla 1999). Volunteers, including youths, have undertaken awareness-raising campaigns and mangrove reforestation activities (DENR Philippines 2020).

Figure 14: Fisheries and Aquaculture in Quezon Province (2000–2018)



Source: Authors' development using data from the Philippine Statistics Authority (PSA).

Figure 15: Changes in the Mangrove Cover and Brackish Water Fish Ponds in the Philippines (1970–1992)

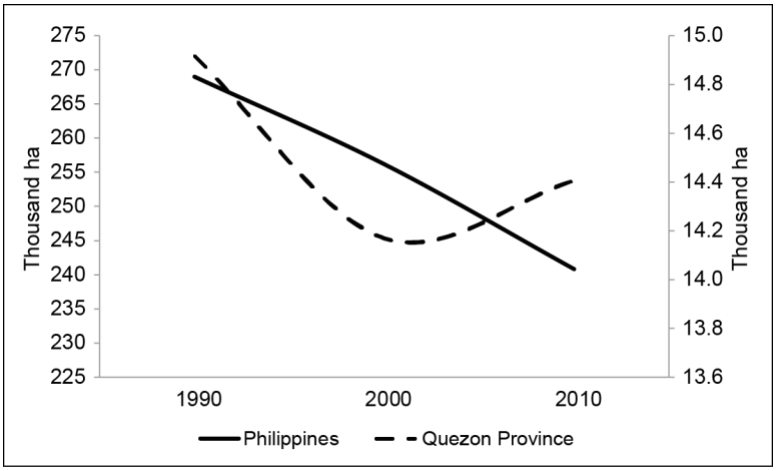


Source: Tingson's development using information from the Forest Management Bureau and the Bureau of Fisheries and Aquatic Resources, Philippines.

Mangrove forests provide important multiple ecosystem services. They offer breeding and feeding sites for aquatic and avian species. The fish stocks that the coastal mangrove areas harness are vital for small-scale coastal fishermen. Mangrove forests also provide bio-protection from coastal erosion and function as a carbon sink. Mangroves perform indispensable tasks for climate change mitigation and adaptation. There is a possible causal link between the reduction in commercial fishing, the increase in aquaculture, and the reduction in mangrove cover. The government has introduced increased regulations to protect mangrove forests. Their policy

effectiveness needs assessment. At the same time, the causal link between aquaculture expansion and mangrove forest reduction requires monitoring to ensure that fisheries and aquaculture operate in a sustainable manner without creating damage that is detrimental to marine, coastal, and terrestrial ecosystems.

Figure 16: Changes in the Mangrove Cover in the Philippines and Quezon Province



Source: Authors' development using information from Long et al. (2014).

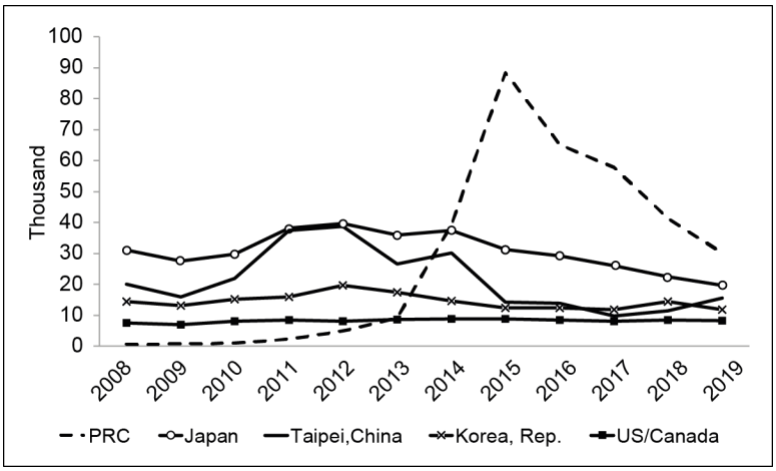
4.3 Palau

The Republic of Palau is an archipelago in the Pacific with over 700 islands and a total land area of 488 km^2 (Ministry of Natural Resources, Environment, and Tourism (MNRET), Palau 2016). The exclusive economic zone of Palau covers 3.1 million km^2. This is why Palau, like other small island countries, is called a small island and large ocean state (Office of the President, Republic of Palau 2020). Its diverse marine fauna and flora and its topography attract tourists from around the world. Tourism has become a major industry for Palau. The UNESCO World Heritage listed the Rock Islands Southern Lagoon in Koror State, which includes 445 uninhabited limestone islands and has over 385 species of coral reefs, as a natural site in 2012.[8] The Government of Palau has reinforced nature conservation as a policy priority and legislated the Palau National Marine Sanctuary Act in 2015, which aims to protect 80% of its EEZ as a no-take marine protected area, with no permitted commercial fishing as of 1 January 2020 (Government of Palau 2015). The Act established domestic fishing zones around the main island of Babeldaob. The vessel days, a permit for operating fishing vessels under the Nauru Agreement, were to decrease each year from 2016 to 2019. In June 2019, with a view to enhancing the conservation efficiency and supporting the development of the fisheries and seafood sectors, the government revised the PNMS Act to relocate the fishing zone to the northwest of Palau and allow foreign fishing vessels to fish with permits from the Minister for Marine Resources, Environment, and Tourism (Office of the President, Republic of Palau 2019).

[8] The International Union for Conservation of Nature (IUCN). https://worldheritageoutlook.iucn.org/explore-sites/wdpaid/555547992 (accessed on 7 January 2021).

Palau has also introduced a green fee, which it raised to US$100 per tourist and renamed the Palau Pristine Paradise Environmental Tax in January 2018. Koror State also collects a fee of US$100 for the entry permit to Rock Islands and Jellyfish Lake, popular tourist destinations. The elimination of illegal fishing has become an important policy goal, and Palau has developed its cooperation with international partners, such as the Nippon Foundation and the Government of Australia, to strengthen its maritime surveillance capacity (Government of Palau 2018; Carreon 2020). Palau has reinforced the progressive shift from fisheries to marine conservation and tourism. The total number of foreign tourists to Palau increased from 85,000 in 2010 to 164,000 in 2015, a 93% increase. The Rock Island inscription to the IUCN World Heritage natural sites in 2012 presumably boosted the increase. In terms of the nationality of foreign tourists, it is notable that the number of tourists from the People's Republic of China (PRC) jumped from 1,000 in 2010 to 88,000 in 2015, an eightfold increase (Figure 17). Meanwhile, the number of tourists from Japan; Taipei,China; and the Republic of Korea declined from their peak in 2012. The number of tourists from the PRC plunged from 88,000 in 2015 to 30,000 in 2019. The total number of tourists in 2019 increased by 11.2% from 2010 but declined by 42.6% from 2015.

Figure 17: Trends in the Top 5 Numbers of Tourists to Palau (2008–2019)



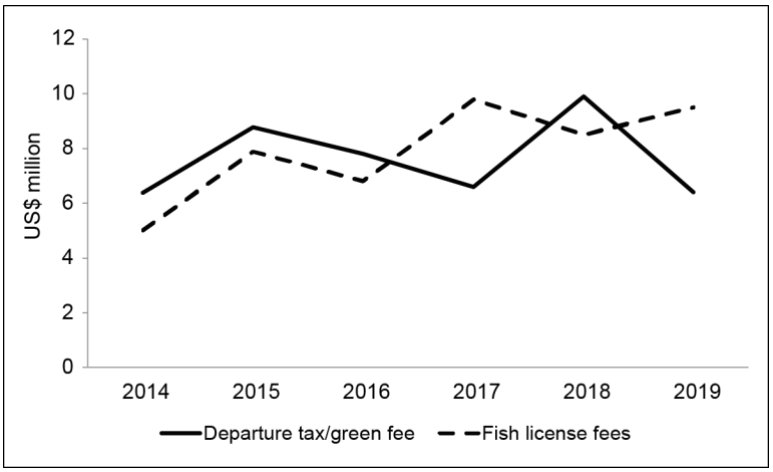
Source: Authors' development using information from the Government of Palau (https://www.palaugov.pw/visitor-arrivals/).

Multiple factors were involved in the declining tourist numbers. A severe drought hit Palau in 2016, and the government issued water use restrictions, though the measures that it took were to ensure the comfort of the tourists (Pacific Island Resort 2016). The Chinese authority banned group tours from the PRC in November 2017, presumably due to the absence of diplomatic relations between the Republic of Palau and the PRC (Cole 2017). Jellyfish Lake, one of the popular tourist destinations, continued to suffer the impacts of the drought. Jellyfish disappeared, and the tour operators suspended their visits. Jellyfish Lake was closed for 2 years to support the recovery of the jellyfish. The jellyfish population was an estimated 10 million–20 million, with a peak of 30 million in 2005, which disappeared after the 2016 drought. Previously, about 700 visitors per day had paid US$50 for an entry permit. The estimated lost revenue from the closure of Jellyfish Lake could be US$35,000 per day and over US$1 million per year. It revived to 630,000 in January 2019, when Jellyfish Lake reopened after the 2-year closure (Wong 2019). In addition, recurring super typhoons damaged the coral reefs, another tourist attraction in Palau (Palau International Coral Reef Center (PICRC) 2015). It is possible to support tourism by enabling policy measures to

capitalize on the potential synergies between nature conservation and tourism. At the same time, political and climatic conditions can affect tourism.

Tourism benefits Palau's economy at multifaceted levels. The major revenue from tourism for the national government is from the departure tax, which is now called Palau's Pristine Paradise Tax (PPPT). The total revenue fluctuates depending on the number of tourists and the amount of fees that they pay. The revenue from the departure tax and PPPT, for instance, has mainly been larger than the revenue from fishing license fees in the past (Figure 18). Due to COVID-19, Palau has suspended tourism since March 2020, which could result in a short-term deficiency in the policy's performance (Maritime Executive 2020). The policy direction and its impacts need continuous monitoring to balance and optimize the multiple policy goals toward the achievement of the conservation and sustainable management of marine ecosystems and the promotion of sustainable development.

Figure 18: Changes in the Government Revenues (2014–2019)



Source: Authors' development using information from the Government of Palau (https://www.palaugov.pw/wp-content/uploads/2020/07/2019-Statistical-Yearbook.pdf, accessed on 2 January 2021).

5. DISCUSSION

The cases that the previous sections presented exhibited the multidimensional interface of biophysical, socio-economic, and policy and institutional aspects that are vital for promoting a sustainable blue economy. There are enabling factors that appear to be important in the pursuit of a sustainable blue economy. Figure 19 illustrates the multifaceted interface of enabling and intervening factors for a sustainable blue economy. The aforementioned case studies presented many enabling and intervening factors, though some more appear here to substantiate further the depiction of the multifaceted interface of enabling and intervening factors for a sustainable blue economy.

(i) Policy frameworks

Japan enacted the Basic Act on Ocean Policy, which the Basic Plan on Ocean Policy embodied, encouraging Taketomi Town to develop its own local basic ocean policy plan. Palau's National Marine Sanctuary Act signaled a clear-cut message to both national and international stakeholders on the priority importance that it attached to marine ecosystem conservation and law enforcement in this respect. It is useful to develop such a policy framework.

(ii) Multi- and cross-sectoral platform

In Minamisanriku, Hinase, and Erimo, fishermen collaborated to promote environmentally sound oyster production, seagrass restoration, and coastal vegetation activities. Hinase formed a multi-stakeholder platform to promote seagrass restoration, social learning, and tourism. In Kumejima, a cross-sectoral platform allowed businesses and entrepreneurs to collaborate to promote the secondary use of deep seawater.

(iii) Multiple benefit promotion

It is necessary to turn the benefits arising from biological resources into other ecological or socio-economic benefits. The value of mangroves became the basis for sea kayaking eco-tourism in Taketomi. The improvement of terrestrial vegetation cover acted as a driver to improve kelp and fishery production in Erimo. The Philippines considered the conservation of mangroves as important to local tourism as well as coastal and fisheries. Marine conservation was a recognized centerpiece of Palau's policy to promote tourism.

(iv) Science and innovation

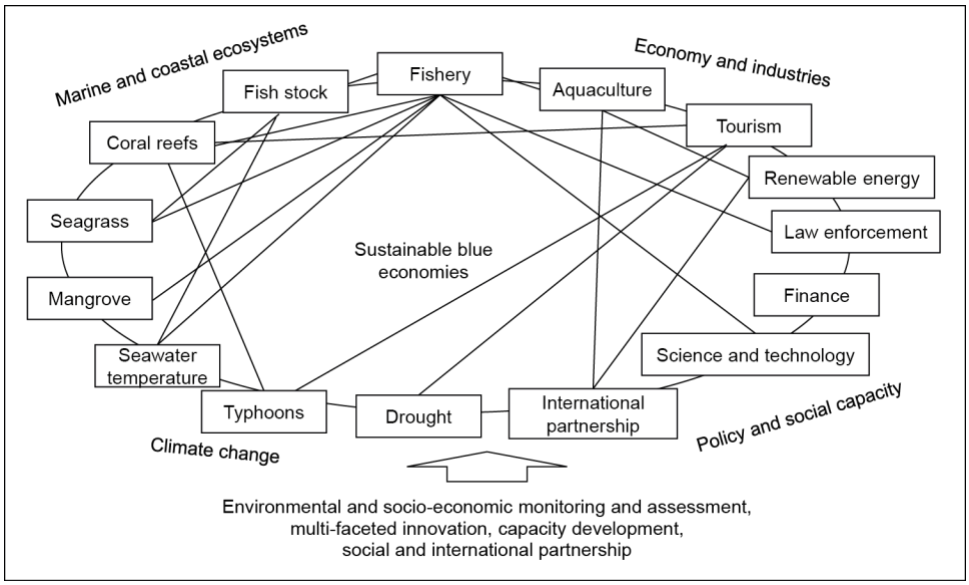
In Minamisanriku, coastal and marine ecosystem assessment and advice from experts provided useful perspectives for the local oyster farmers to shift from intensive farming to optimal farming. Thorough feasibility studies and expert guidance reinforced the foundation for the successful launch and operation of OTEC in Kumejima. The acquisition of MSC certificates in Minamisanriku was a result of social innovation and partnership.

(v) Finance

In Kumejima, funding from the national and local government was the key to planning and constructing the OTEC facility. In Erimo, funding from the Forestry Agency was critical. In forging the capacity for marine surveillance, international partnership appeared to be important to support the Government of Palau in enforcing its sanctuary policy.

On the other hand, a number of challenges have arisen in the pursuit of a sustainable blue economy. The most notable factor is climate change. In Erimo, the seawater temperature rise is now detrimental to kelp production. In Palau, drought and typhoons affect tourism. There are a number of trade-offs in the use of coastal and marine resources. The case of Quezon Province indicated the possible vicious cycle of fish stock depletion, rapid development of aquaculture, and destruction of mangroves. The impacts of the COVID-19 pandemic need assessment. The blue economy, particularly the tourism and fishery sectors, are prone to such external shocks. Adaptive management in the pursuit of the sustainable blue economy is vital as countries and stakeholders remain susceptible to the myriad changes and uncertainties that can affect the efforts to promote the sustainable blue economy.

Figure 19: Multifaceted Interface of Enabling and Intervening Factors for the Sustainable Blue Economy



6. CONCLUSIONS

The Asia and the Pacific region has considerable potential to benefit from the promotion of a sustainable blue economy. On the other hand, the region remains susceptible to various potential trade-offs and uncertainty. Adaptive management continues to be a key feature of the pursuit of a sustainable blue economy. Innovation and social and international partnership are a vital part of such efforts. It is important to capitalize on the momentum of the sustainable blue economy, and it is useful to forge policies and institutional frameworks at multiple levels in this respect. Policy and institutional transformations need support from inclusive policy dialogues based on science. It is vital for policymakers and stakeholders to reinforce their partnership and interaction to demonstrate success stories and achieve the common goals of promoting a sustainable blue economy and handing over healthy oceans to future generations.

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