PUEAA

Working Paper 27

Blue Economy in the Pacific Rim: The Role of Japan and Mexico

by

Antonina Ivanova

August 2024

Abstract

The concept of the *Blue Economy* (BE) emerged during the Rio+20 summit proposed by several coastal countries. It aims to improve human well-being and social equity while reducing environmental risks and ecological damage. The objective of this chapter is to present the importance of the blue economy in the Pacific Rim and APEC, as well as its contribution to sustainability and climate action. To meet the objective, first, the systematic search methodology was applied to several academic and institutional websites. The conclusions highlight the importance of the blue economy in Japan and Mexico recognizing the contribution of the oceans to address the impacts of climate change, especially through blue carbon initiatives, and promoting sustainable and inclusive development in the Pacific Rim. Finally, some areas to enhance BE performance are suggested.

Resumen

El concepto *Blue Economy* (BE), en español conocido como Economía Azul, fue propuesto por varios países costeros durante la cumbre de Río+20. Su objetivo es mejorar el bienestar humano y la equidad social mientras se reducen los riesgos medioambientales y los daños ecológicos. Esta investigación tiene como objetivo presentar la importancia que tiene la economía azul en la cuenca del Pacífico y en el APEC, así como en la contribución a la sostenibilidad y la acción por el clima. Para cumplir el objetivo, se desarrolló mediante una búsqueda sistemática en diversos sitios web, tanto académicos como institucionales. Las conclusiones destacan la importancia de la economía azul en Japón y México y reconocen la contribución de los océanos para enfrentar los impactos del cambio climático, especialmente a través de iniciativas de carbono azul, y promoviendo el desarrollo sustentable e incluyente en la Cuenca del Pacífico. Por último, se proponen algunas áreas de oportunidad para mejorar el rendimiento de la BE.

Blue Economy in the Pacific Rim: the Role of Japan and Mexico

Antonina Ivanova

Introduction

The *Blue Economy* (BE) concept was adopted during the preparatory process for Rio+20. Many coastal countries suggested that the term Green Economy can be described as Blue Economy when applied to coasts and oceans. This approach contemplates improving human well-being and social equity, while reducing environmental risks and ecological damage (UNEP *et al.*, 2012), according to the needs of countries whose development depends on marine resources.

The Blue Economy is the pathway through which APEC member economies address mutual problems and development aspirations such as inclusive growth and sustainable development (APEC, 2019). The key sectors of the Blue Economy are Fishing and Aquaculture, Ocean Renewable Energy, Ports and Maritime Transport, Marine Hydrocarbons and Seabed Mining, Marine Biotechnology, Research and Development, and Tourism.

By 2030, the marine protected areas will expand from 11% to 30% (BCI, 2023). The United Nations has enshrined the protection of oceans and seas in Goal 14 Life below Water of the Sustainable Development Goals. The importance of the blue economy is highlighted in the proclamation by the United Nations of the Decade of Ocean Sciences for Sustainable Development (2020–2030) to guarantee the full support of marine sciences for the sustainable use of the oceans, generating synergies with the social sciences and humanities to promote the conservation of natural resources and

contribute to the well-being of communities. All of the above would support countries to achieve the Sustainable Development Goals of the 2030 Agenda (APEC, 2019).

The Xiamen Declaration "Towards a new partnership through ocean cooperation in the Asia-Pacific region" includes four priority areas: conservation of coastal and marine ecosystems and resilience to disasters; the role of the ocean in food security and food-related trade; marine science, technology and innovation; and the blue economy (Ivanova and Torres, 2021; Juneja *et al.*, 2021).

This chapter aims to present the importance of the oceans and the blue economy in the Pacific Rim, as well as their contribution to sustainability, marine biodiversity conservation, climate action, and the well-being of the coastal communities. The chapter is divided into the following sections. Firstly, it explains what the blue economy consists of and why it is important to promote sustainability and inclusion. The second and third sections present the blue economy policies and actions of two economies-members of APEC on both sides of the Pacific Rim: Japan and Mexico, respectively.

To develop the study, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology was applied to carry out systematic reviews and meta-analyses in scientific research. The PRISMA method provides a structured and transparent framework, ensuring the appropriate inclusion of relevant studies and the clear presentation of results. A search was carried out for articles from indexed journals on several academic websites. These sources were complemented with some reports and statements from the APEC website, and from some government agencies and non-governmental organizations (NGOs) from Japan and Mexico. The results were presented and analyzed, allowing some conclusions to be reached.
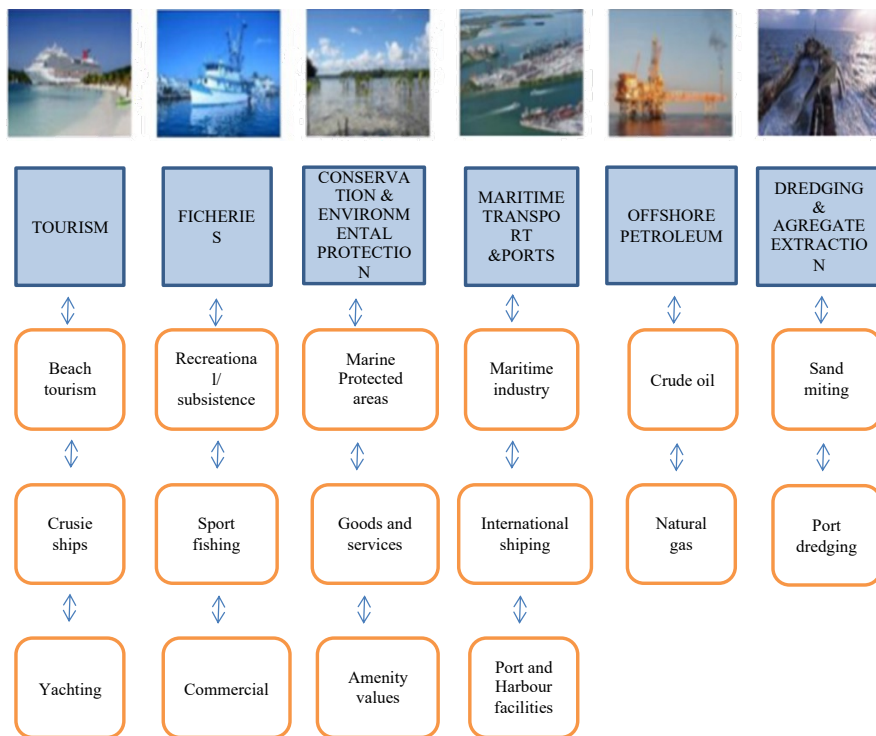
Blue Economy: Concept and Relevance

SDG 14 presents the importance of the ocean, as well as the opportunities and challenges presented by its sustainable use: "Conserve and sustainably use the oceans, seas and marine resources for sustainable development" (UNGA, 2015). The Ocean Foundation (2023) reports that human activities are responsible for the 30% increase in ocean acidity over the past two centuries. The coastal ecosystems absorb and store significant amounts of carbon dioxide from the atmosphere, called blue carbon, making them an important component in climate change mitigation (IPCC, 2022).

By 2025, 83% of the global carbon cycle will circulate through the ocean, while 50% of coastal habitats absorb almost half of the total carbon sequestered in coastal areas (BCI, 2023). These pressures, along with a projected increase in the world's population to 10 billion by 2050, will undoubtedly intensify global competition for resources, making sustainable ocean management an area of primary importance (World Resources Institute, 2018).

According to the Food and Agriculture Organization of the United Nations (FAO), almost 60 million people around the world (more than 96% of them in emerging countries in Asia and Africa) work in the fishing and aquaculture sectors (FAO, 2020). According to the South Asian Ocean Management Association (PEMSEA, 2020), the blue economy annually generates USD $1.5 trillion (2.5% of global gross value added) and employs 31 million people. By 2030, this is projected to rise to USD$3 trillion, with aquaculture rising sharply (8.5% annually currently), offshore wind, fisheries management, and shipbuilding and repair (Ivanova and Torres, 2021).

International law is a key component of the blue economy along with ocean governance. The EA strengthens environmental legislation and institutional arrangements that empower communities, civil society organizations, and public entities (Ivanova and Torres, 2021). Figure 1 shows the main activities of the blue economy.

Figure 1. Main Activities of Blue Economy

TOURISM	FICHERIES	CONSERVATION & ENVIRONMENTAL PROTECTION	MARITIME TRANSPORT &PORTS	OFFSHORE PETROLEUM	DREDGING & AGREGATE EXTRACTION
⇕	⇕	⇕	⇕	⇕	⇕
Beach tourism	Recreational/ subsistence	Marine Protected areas	Maritime industry	Crude oil	Sand miting
⇕	⇕	⇕	⇕	⇕	⇕
Crusie ships	Sport fishing	Goods and services	International shiping	Natural gas	Port dredging
⇕	⇕	⇕	⇕		
Yachting	Commercial	Amenity values	Port and Harbour facilities		

Source: Own elaboration.

The following paragraph presents the newest definitions of the Blue Economy based on the United Nations document Blue Economy Definitions (2023). According to the World Bank, the blue economy is the "sustainable use of ocean resources for economic growth, better livelihoods and jobs, while preserving the health and ecosystems of the

oceans". The European Commission defines it as "All economic activities related to oceans, seas and coasts. It encompasses a wide range of interrelated established and emerging sectors".

The Commonwealth of Nations considers it "an emerging concept that encourages better stewardship of our 'blue' oceans or resources". Conservation International adds that "the blue economy also includes economic benefits that cannot be untraded, such as carbon storage, coastal protection, cultural values, and biodiversity. The Center for the Blue Economy says it "is now a widely used term around the world with three related but distinct meanings: the overall contribution of the oceans to economies, the need to address the environmental and ecological sustainability of the oceans, and the ocean economy as a growth opportunity for both developed and developing countries".

Recently the Blue Economy was characterized as an economy that "comprises a range of economic sectors and related policies that together determine whether the use of ocean resources is sustainable". A major challenge of the blue economy is to better understand and manage the numerous aspects of ocean sustainability, ranging from sustainable fisheries to ecosystem health and pollution prevention. The blue economy also challenges us to realize that sustainable management of ocean resources will require collaboration across borders and sectors through a variety of partnerships, and on a scale that has not been achieved before. FAO (2020) defines BE as: "A rational approach to the sustainable and comprehensive management of the oceans and coasts".

The following sections present some blue economy policies and actions in Japan and Mexico. The selected activities contribute to marine ecosystem conservation, climate action (mitigation and adaptation), and to the sustainable development of the local communities.

Japan

Japan's territory covers 377 973.89 km2 (see Figure 2). It is the fourth-largest island country in the world and the largest island country in East Asia. The country has the 6th longest coastline at 29 751 km Because of Japan's many far-flung outlying islands and long coastline, the country has extensive marine life and mineral resources in the ocean. The Exclusive Economic Zone (EEZ) of Japan covers 4 470 000 km2 and is the 8th largest in the world. These data show the importance of oceans and blue economy for Japan.

Figure 2. Map of Japan

Source: Wikipedia, https://en.wikipedia.org/wiki/Geography_of_Japan

Japan Blue Economy Association

The Japan Blue Economy (JBE) Association was established by researchers, engineers, and practitioners in various fields and positions to work closely together to conduct research and development of technologies and methods to promote projects that will be useful in the conservation and restoration of coastal areas (JBE, 2021). The goal is to develop new methods and technologies to deepen the relationship with the ocean and sustainably enjoy the benefits of the ocean for generations to come (Steven *et al.*, 2019).

In Japan, citizens, private sector organizations, financial institutions, and local governments are participating in projects that lead to the conservation and creation of environmental values in coastal areas, but these endeavors are often not being implemented efficiently and effectively. To solve this issue, the Japan Blue Economy (JBE) Association aims to promote research and development of technologies and methods necessary to revitalize projects that will help conserve and restore coastal areas through close cooperation among researchers, engineers, and practitioners in various fields and capacities (JBE, 2021).

The JBE established and manages the Japan Blue Economy Research Group (BERG) to disseminate knowledge and share information on JBE's research as well as on joint research by JBE and BERG members. The JBE also aims to develop new methods and technologies to deepen our relationship with the ocean so that we can continue to benefit from it for generations to come. The aim is also to promote research in collaboration with a variety of partners, including private companies, municipalities, and NGOs under the supervision of the Japanese government. It is very important to foster regional and international cooperation (Juneja *et al.*, 2021).

Using scientific and technological evidence, JBE develops methodologies to provide solutions for various needs associated with the blue economy as well as quantitative evaluations of ecosystem services and economic values. The potential needs include the following:

- Raising national awareness of the environmental work that partner organizations are doing at their local sites and obtaining funding for their activities.

- Quantifying the partner's environmental, social, and governance (ESG) efforts, in particular, their activities contributing to society related to SDG 14 (Life Below Water), and SDG 13 (Climate Action).

- Determining how much carbon dioxide is absorbed by vegetation growing on rocky shores and seawalls, often in plain view. JBE responds to such needs by providing scientific and technological evidence, numerical values, economic values, and specific methods.

JBE is a nationally approved corporation under the Ministry of Economy, Trade and Industry's Collaborative Innovation Partnership program. The aim is to establish and launch a new legal entity that will expand social activities in the next few years as research results are produced in collaboration with the partners.
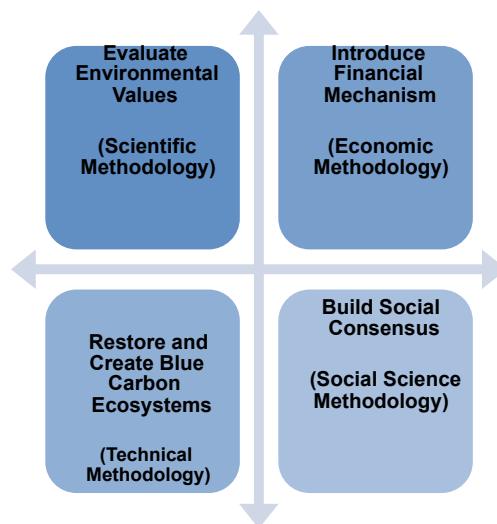
Blue carbon gains momentum in Japan

Coastal ecosystems can provide a wide range of services such as supporting fisheries, coastline protection from storms and sea-level rise, shoreline erosion prevention, water purification, biodiversity conservation, or food security for coastal communities, all of which are essential for climate change adaptation. Additionally, some of them can also

work effectively to capture and store organic carbon acting as a carbon sink in the plants themselves and the sediments below, and that contributes to climate change mitigation (Steven *et al.*, 2019).

Japan has a long history of making the most of the seas surrounding its many islands. Attention is now turning to so-called blue carbon, an expression that encapsulates the role of oceans and marine life in sequestering carbon dioxide. A variety of initiatives are underway to revitalize ocean habitats and local economies while allowing sponsors to offset carbon emissions by providing financial support through blue-carbon trading schemes. Figure 3 presents the process of the Japanese blue carbon initiative with corresponding methodologies.

In 2019 local governments and other bodies certified by the Japan Blue Economy Association began a blue-carbon trading scheme. This allows companies and organizations to support such efforts and offset their carbon emissions.

Figure 3. Process of Blue Carbon Initiative

Source: Own elaboration with data from JBE (2021)

The association had certified 21 locations around Japan as blue-carbon sites by the end of fiscal 2022 and says that sponsorship had been secured for the sequestration of more than 3 700 tons of carbon. For local governments, the funds obtained can be used for activities aimed at giving a boost to the economy and conserving nature.

Eelgrass restoration as a blue-carbon initiative

Expanses of eelgrass in relatively shallow sea areas act as a nursery, refuge, and breeding ground for a wide variety of sea life. The plant also absorbs carbon dioxide in the process of carrying out photosynthesis, which contributes to environmental protection.

In Hannan City, Osaka Prefecture, a local fishery cooperative and an elementary school are working together to plant eelgrass. Funds raised from the trading scheme have been used for ocean conservation activities and other purposes.

In Oita Prefecture's Nagoya Bay, meanwhile, an effort is underway to restore seaweed by removing sea urchin, which can overbreed and do severe damage to kelp forests and other habitats. This imbalance is known in Japanese as *isoyake*. The spiky creatures are raised in tanks on shore so they can be sold on when they are ready for market (Kittipaisalsilpa, 2023).

Eelgrass once thrived in Matsushima Bay, but most of it was lost when the seabed was scoured by the massive tsunami of 2011. Local fishers and other concerned citizens have been working to bring the eelgrass back to life. In mid-November about 50 people, including parents and children, gathered at the port in Miyagi Prefecture's Shiogama to help with an effort to revive eelgrass in Matsushima Bay (Kotaro, 2023).

Efforts to restore marine ecosystems such as the one in Matsushima Bay offer an ideal combination of nature conservation and carbon absorption.

Blue carbon-oyster farming

Oysters are also getting a blue-carbon rebrand. The mollusks are a specialty of Minamisanriku Town in Miyagi Prefecture.

It would be the first such certification in Japan. Officials are hopeful that being acknowledged as a blue-carbon site will help revitalize the local economy (Kotaro, 2023). And there may be more good news about oyster farming. DNA analysis indicates that as many as five fish species, including goby and ayu, live in and around the seaweed-laden oyster racks.

Municipal authorities believe that oyster cultivation helps to maintain the marine ecosystem, in part by providing homes for small fish that have suffered habitat loss due to *isoyake*. They aim to have this ecological upside added to the list of features that merit blue-carbon certification. It is not a natural habitat for the fish, but they live there because they have found it a good place to live. It is an unexpected byproduct of oyster farming (Kotaro, 2023).

According to the Blue Economy Association, a higher value could be assigned to oyster racks that can be shown to provide fish habitat, potentially bringing in more funds. Minamisanriku aims for certification in February of 2025. If the oyster farms are not only producing shellfish for the market but also maintaining the health of the sea, it will be a real fillip for the aquaculture industry.

Mexico

Mexico has a 9 330-kilometer coastline, of which 7 338 kilometers face the Pacific Ocean and the Gulf of California, and the remaining 2 805 kilometers are in the Gulf of Mexico and the Caribbean Sea (see Figure 4). Mexico's exclusive economic zone (EEZ) covers 3 269 386 km2 and is the 13th largest in the world. It extends 200 mi (320 km) nautical miles off each coast. Thus, oceans and BE are of utmost importance for the country's development.

Figure 4. Map of Mexico

Source: Geology, https://geology.com/world/mexico-satellite-image.shtml#google_vignette

National Seas and Coasts Policy of Mexico

The National Seas and Coasts Policy (NSCP) aims to improve the situation of the marine and coastal areas of Mexico, through management that induces economic and social development without detriment to the natural heritage of these regions (SEMARNAT, 2018). This policy has been in the process of actualization since 2023. Figure 5 presents the main areas of action of NSCP.

Figure 5. Main areas of action of National Seas and Coasts Policy

Effective	Green	Equitable
• Sustainable management of marine protected areas • Climate Change Action • Restauration of mangroves, eelgrass, deep ocean diversity	• Technology transfer • Sustainable management of fisheries and aquaculture.	• Governance: participation of coastal communities, women, and youth in the planning, implementation and monitoring of blue economy actions

Source: Own elaboration with data from SEMARNAT (2018)

According to these actions, the NSCP includes the following general objectives and strategies:

Strategy I. Contribute to improving the living conditions of the inhabitants of coastal populations through the sustainable use of natural resources, comprehensive coastal and marine planning and the reduction of vulnerability to climate change.

- Strategy I.1. Promote and encourage productive diversification through the conservation, management, and sustainable use of natural resources to improve the quality of life of inhabitants in coastal municipalities.

- Strategy I.2. Promote and support the majority of coastal municipalities with "high" and "very high" degrees of marginalization to operate wastewater treatment plants and final waste disposal sites.

- Strategy I.3. Support the implementation of Urban Development Programs in coastal municipalities, with criteria for the social use of coastal spaces in tourist centers.

- Strategy I.4. Support in the design, implementation and/or coordination of actions to reduce vulnerability within the framework of State Climate Change Programs and public policy instruments on climate change.

- Strategy I.5. Promote the identification of areas with the potential to relocate human settlements and/or urban infrastructure that are located in risk areas.

Strategy II. Strengthen local economies, improve regional competitiveness and contribute to the national competitiveness, encouraging economic and productive activities that protect the marine and coastal environment.

- Strategy II.1. Promote foreign policy strategies in intersectoral coordination with the competent agencies and entities involved in the sustainable management of Mexican protected marine areas.

- Strategy II.2. Promote the development of programs with environmental, economic and social criteria for the development and sustainable use of coastal and marine areas.

- Strategy II.3. Promote sustainable certification schemes for productive processes and activities for coastal municipalities associated with ecosystem services in the marine-coastal zone.

- Strategy II.4. Promote the increase in the installed capacity of renewable energies in coastal states.

Strategy III. Ensure that the marine-coastal ecosystems do not suffer irreversible alterations, and maintain and recover their resilience, monitor the goods and services they provide, and their landscape quality.

- Strategy III.1. Promote the development of the National Coastal Inventory, based on socio-economic-environmental variables that contribute to the operational evaluation of ocean health.

- Strategy III.2. Collaborate in the preparation and/or implementation of the four Regional and Marine Ecological Planning Programs.

- Strategy III.3. Participate in the formulation or updating of fishing regulation and management instruments.

- Strategy III.4. Promote local ecological and/or territorial planning in municipalities with a coastal front, determined as priorities.

- Strategy III.5. Promote the creation of a National Marine and Coastal Monitoring and Information System.

- Strategy III.6. Implement the necessary actions for the conservation and management of mangrove ecosystems and biodiversity in coastal maritime areas.

- Strategy III.7. Promote the preparation of hazard studies and/or Risk Atlas for the coastal regions of the national territory defined as sensitive by the competent authority and/or this Commission.

- Strategy III.8. Promote the ratification and implementation of the international commitments signed by Mexico regarding seas and coasts.

For the execution, monitoring, evaluation, and, where appropriate, modification of the National Seas and Coasts Policy of Mexico, a large number of federal, state and municipal regulatory instruments, planning, coordination, information, promotion and financial instruments, were established. Additionally, international instruments have been signed and adopted by the country.

Mexican Fund for Nature Conservation: Seas and Coasts

The Sea and Coast Conservation Program (PCMyC) finances initiatives in Marine Protected Areas (MPA) and their areas of influence to ensure the conservation of a network of representative marine-coastal ecosystems in the long term (MFNC, 2023a). The investments of the Seas and Coasts Conservation Program are aimed at:
Ensure that the management of marine-coastal areas in the Gulf of California and the North Pacific that are priority for biodiversity and environmental services is effective.

- Promote fishing in the MPAs and the area of influence to be sustainable.

- Promote citizen participation and strengthen the social fabric of coastal communities to ensure that coastal development is sustainable.

- Strengthen the institutional and leadership capacities of civil society organizations and communities in northeastern Mexico.

- As a result of the actions of MFNC (Seas and Coasts) 3 695 marine and coastal hectares were restored, 38 threatened species attended, and 24 sub-projects funded.

The Fund for the Gulf of California (FGC)

The FCC's objective is to conserve the network of representative marine-coastal ecosystems of the Gulf of California through the channeling of resources to initiatives in protected natural areas (ANP) and their areas of influence (MFNC, 2023b).

The lines of work that guide the actions of the Gulf of California Fund are the following: use of territorial planning tools; sustainable management; conservation of priority species, conservation of ecosystems and natural resources in priority marine protected areas of the Gulf of California and the North Pacific.

Blue Carbon in Mexico

Mexico has considerable extensions of mangroves and seagrasses covering an estimated surface of 1.1 million hectares (Herrera-Silveira *et al.*, 2020). Because of these ecosystems, Mexico has significant potential to capture and store blue carbon. Despite some protection provided by Mexican regulations, these ecosystems are under constant pressure from land-use changes for various purposes. Over the past 20 years, 24 Mt CO_2 have been emitted in Mexico due to mangrove coverage loss (Herrera-Silveira *et al.*, 2020). That's equivalent to 3% of the total emissions of Mexico in 2017 (Ivanova Boncheva and Bermudez-Contreras, 2022). Financial schemes to support the conservation of blue carbon ecosystems in Mexico could help in maintaining a healthy stock of mangroves and seagrasses.

According to the most recent evaluation by Mexico's Biodiversity Commission (CONABIO), the country has a total mangrove surface of 775 555 ha (Valderrama-Landeros *et al.*, 2017) distributed in five regions (North Pacific, Central Pacific, South Pacific, Gulf of Mexico and Yucatan Peninsula). The Yucatan Peninsula alone accounts for more

than half of the total. Overall, this mangrove area had a net loss of 9.4% between the 1970/1980 records and 2015, with a small recovery between 2010 and 2015. Hamilton *et al*. (2016) ranked Mexico in the top 10 countries with the most mangrove forest area but Mexico was also ranked in the top 10 countries with the highest annual total area of mangrove deforestation between 2000-2012 (Feller *et al.*, 2017). Nevertheless, some steps are already being taken in the right direction. The "Adaptation and Blue Carbon" project is the first adaptation project in Mexico funded with national resources through the Climate Change Fund created by the General Law of Climate Change.

Conclusions

To plan the actions of the blue economy, it is necessary to consider very carefully which regions have true natural potential and where there are the social and political conditions to ensure equitable and sustainable development and guarantee returns on investment. It is possible to find places that can serve as an example of development, but to do so it is necessary to proceed with studies based on natural and social science. The policies and actions of Japan and Mexico presented in this paper consider all these conditions. Above all, they recognize that economic growth is not an end in itself, but rather a pathway for equity, social well-being, and ecological sustainability.

The goals for mitigation are most prominently aligned with climate adaptation objectives, especially for nature-based solutions. Blue carbon ecosystems are very fragile. Marine ecosystems are being lost at a faster rate than those based on land. The loss of these ecosystems is a serious threat to the long list of services they provide in coastal regions, including carbon capture and long-term carbon storage. That's why the actions of Japan and Mexico to protect them are very important. The rewards of blue carbon could ultimately extend well

beyond any industry to the planet as a whole, helping to slow the steady march of climate change and avert its worst consequences. They also promise exciting new chapters in Japan's and Mexico´s vital relationship with their surrounding seas. Recognition of how climate change is likely to influence other development priorities, such as access, justice, and allocation, may be a first step towards building cost-effective strategies and integrated, institutional capacity in Japan and Mexico to respond to climate change.

The present analysis found that the integration of the blue economy, and particularly blue carbon in the public policy of Japan and Mexico, is an important area of opportunity. Mitigating climate change, adapting to sea level rise, and alleviating coastal communities' poverty can all be complementary.

It is important to promote greater use of economic analysis, for example, by developing an accounting framework appropriate for the blue economy, establishing international platforms for the exchange of knowledge, experiences and best practices, and intensifying efforts to evaluate the economic effectiveness of public investment in marine research and observation. Very important is the innovation in governance structures, processes, and stakeholder engagement to make integrated blue economy management more effective, more efficient, and more inclusive. In all these areas the collaboration between Japan and Mexico should be fostered.

References

Asia-Pacific Economic Cooperation Forum (APEC) (2019). *APEC Marine Sustainable Development Report. Part 2: Supporting Implementation of Sustainable Development Goal 14 and Related Goals in APEC*, APEC Ocean and Fisheries Working Group. Asia-Pacific Economic Cooperation Forum. Available: https://www.apec.org/

docs/default-source/publications/2019/12/apec-marine-sustain-able-development-report-2/219_ofwg_apec-marine-sustainable-de-velopment-report-2.pdf?sfvrsn=78df3ce1_1

Blue Carbon Initiative (BCI) (2023). "Mitigating Climate Change through Coastal Conservation". *Blue Carbon Initiative*. Available: https://www.thebluecarboninitiative.org/

Food and Agriculture Organization (FAO) (2020). *State of the World Fisheries and Aquaculture 2020*, FAO. Available: https://www.fao.org/3/i3720e/i3720e.pdf

Feller, I., *et al.* (2017). "The state of the world's mangroves in the 21st century under climate change", *Hydrobiologiy*, 803(1), pp. 1–12.

Herrera Silveira, J. and Teutli Hernández, C. (2020). "Blue carbon, mangroves and public policies", *Elementos para Políticas Públicas*, 1(1), CINVESTAV.

Intergovernmental Panel on Climate Change (IPCC). (2022). "Climate Change. 2022: Impacts, Adaptation, and Vulnerability: Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change", Cambridge, UK and New York: Cambridge University Press. Available: Available: https://doi.org/10.1017/9781009325844

Ivanova Boncheva, A. and Bermudez- Contreras, A. (2022). "Blue Carbon in Emissions Markets: Challenges and Opportunities for Mexico", in (Lucatello, S., ed.). *Towards an Emissions Trading System in Mexico: Rationale, Design and Connections with the Global Climate Agenda*. Outlook on the first ETS in Latin America and Exploration of the Way Forward, pp. 265-285, GIZ& Springer. Available: https://doi.org/10.1007/978-3-030-82759-5

Ivanova, A. and Torres, A. (2021). "Blue Economy: a pathway to sustainable and inclusive development in APEC" in (Girón, A., A. Ivanova y A. Zamora, Coord.), *México en APEC: Agenda en tiempos de pan-*

demia, CONMEX-CEAPEC, UABCS, UNAM, Universidad Veracruzana, pp. 185-200.

Japan Blue Economy Association (JBE) (2021). *Overview of Research and Development*. Available: https://www.blueeconomy.jp/en/

Juneja, M., *et al*. (2021). "Contextualising Blue Economy in Asia-Pacific Region. Exploring Pathways for a Regional Cooperation Framework, The Energy and Resources Institute (TERI), India: Konrad Adenauer Stiftung". Available: https://www.kas.de/documents/265079/265128/Contextualising+Blue+Economy+in+Asia-Pacific+Region+Exploring+Pathways+for+a+Regional+Cooperation+Framework.pdf/bfdc30c8-e39c-08f4-c975-d57a8aff284b

Kittipaisalsilpa, P. (2023). "Blue economy solutions exist and it is time for action. Asia Pathways", ADBInstitute. Available: https://www.asiapathways-adbi.org/2023/08/blue-economy-solutions-exist-and-it-is-time-for-action/

Kotaro, K. (2023). "Blue Carbon Gains Momentum in Japan". Available: https://www3.nhk.or.jp/nhkworld/en/news/backstories/2910/

Mexican Fund for Nature Conservation (MFNC) (2023a). Seas and Coasts, Available: https://fmcn.org/es/programas-proyectos/mares-y-costas#:~:text=El%20Programa%20de%20Conservaci%C3%B3n%20de,representativos%20en%20el%20largo%20plazo

MFNC (2023b). "Fund of the Gulf of California". Available: https://fmcn.org/es/proyectos/fondo-para-el-golfo-de-california-fgc

Ocean Foundation (2023). "Ocean and Climate Change". *Ocean Foundation*, Available: https://oceanfdn.org/ocean-and-climate-change/

Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) (2020). "PEMSEA Annual Report 2019, Partnerships in Environmental Management for the Seas of East Asia, Quezon, Filipinas". Available: https://www.pemsea.org/resources/publications/reports/annual-reports

SEMARNAT (2018). National Seas and Coasts Policy of Mexico (NSCP). Available: https://apps1.semarnat.gob.mx:8443/dgeia/compendio_2020/dgeiawf.semarnat.gob.mx_8080/approot/dgeia_mce/html/RECUADROS_INT_GLOS/D3_MARES/D3_MARES01/D3_R_MARES01_03.html

Steven, A., Vanderklift, M. and Bohler-Muller, N. (2019). "A new narrative for the Blue Economy and Blue Carbon", *Journal of the Indian Ocean Region*, 15 (2), pp. 123-128. Available: https://doi.org/10.1080/19480881.2019.1625215

United Nations (2023). "Blue Economy Definitions", UN. Available: https://www.un.org/regularprocess/sites/www.un.org.regularprocess/files/rok_part_2.pdf

UNEP, FAO, IMO, UNDP, IUCN, World Fish Center, Grid-Arendal (2012). "Green Economy in a Blue World". Available: https://www.undp.org/sites/g/files/zskgke326/files/publications/Green_Economy_Blue_Full.pdf

United Nations General Assembly (UNGA) (2015). "Transforming our World: The 2030 Agenda for Sustainable Development". Available: https://sdgs.un.org/publications/transforming-our-world-2030-agenda-sustainable-development-17981

Valderrama-Landeros, L. *et al.* (2017). *Manglares de México: actualización y exploración de los datos del sistema de monitoreo 1970/1980–2015*, Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, Ciudad de México. Available: http://bioteca.biodiversidad.gob.mx/janium/Documentos/12889.pdf.

World Resources Institute (2018). "How to Sustainably Feed 10 Billion People by 2050 in 21 Charts". Available: https://www.wri.org/insights/how-sustainably-feed-10-billion-people-2050-21-charts