PAKISTAN'S QUEST FOR SUSTAINABLE MARITIME DEVELOPMENT

Dr. Summar Iqbal Babar and Muhammad Danish Masood[*]

Abstract

Sustainable Development Goals (SDG) prioritise the conservation of marine ecosystems, explicitly emphasising effective and efficient coastal management and blue economy as a new concept of sustainable economic development. While Pakistan has long been disregarding its maritime capabilities, being a country with a rich coastline, it has vast potential to utilise its advantageous geographical location for seaborne trade. Pakistan needs a blue economy shift due to the increasing demand for eco-friendly development and proper management of available resources. The study explores Pakistan's current maritime resource utilisation, identifying challenges such as overfishing, outdated infrastructure, and bureaucratic hurdles. It emphasises the need for policy reforms, enhanced human resource capacity, and technological advancements. The significance of mangrove conservation, sustainable fishing practices, and private sector investment are pivotal for economic growth and ecological balance. To harness the blue economy potential sustainably, Pakistan must undertake policy reforms, strengthen its human resource capacity, and cooperate across sectors and with other countries.

Keywords: Blue Economy, Maritime Potential, Capacity Building, Public-Private Partnership, Exclusive Economic Zone, Sustainability.

Introduction

The term Blue Economy, as defined by Gunter Pauli in 2014, represents a collective effort to move from scarcity to abundance, where the oceans and seas holding the resources are put to optimal use. This concept of restoration of the ecosystem and humanity's attempt to live in harmony with nature gained significant attention during the United Nations Conference on Sustainable Development in Rio de Janeiro in 2012. There, a collective

[*]Dr Summar Iqbal Babar is an Assistant Professor at School of Politics and International Relations (SPIR), Quaid-i-Azam University, Islamabad. Muhammad Danish Masood is a Graduate at School of Politics and International Relations (SPIR), Quaid-i-Azam University, Islamabad. The authors' email address is summar.rao@qau.edu.pk.

recognition of the potential to develop the Blue Economy into a viable and enduring economic model emerged. The subsequent United Nations' 2030 Agenda for SDGs further solidified this commitment, especially in SDG-14, Life below Water. This goal emphasises the collective responsibility to protect and use seas, oceans, and marine resources as part of sustainable development. By recognising the importance and need to conserve, protect and manage ocean resources, the Blue Economy becomes a strategic approach that necessitates collaboration and shared commitment to enhancing economic growth and sustaining the earth's critical marine habitats[1].

Pakistan, which has formerly paid little attention to its maritime capabilities, possesses several unique opportunities due to its geopolitical location. With around 1,000 kilometres of coastline and several ports, including Karachi, bin Qasim, and Gwadar, Pakistan is now strategically positioned to maximise its access to international trade and energy supply routes. With an Exclusive Economic Zone (EEZ) of about 240,000 square kilometres and an additional 50,000 square kilometres of continental shelf area, Pakistan's maritime territory possesses unexplored and potentially rich seas, offshore and deep-sea resources.

Nevertheless, in recent years, Pakistan has started understanding and appreciating the importance of maritime security and the great opportunities for sea-borne trade and commerce. Due to the energy crisis and economic problems, the country has a new hope to exploit offshore oil and gas resources, including the Gwadar port, which is a part of the China-Pakistan Economic Corridor (CPEC). Despite these developments, the current level of utilisation of the Blue Economy resources in Pakistan is considered suboptimal and contributes to about 0.4 per cent of the national GDP. While the fisheries sector generates approximately US $450 million, the estimated potential of the Blue Economy in Pakistan surpasses US $100 billion, highlighting significant untapped opportunities for economic growth and development through the harnessing of oceanic resources[2].

This paper addresses the current state of Pakistan's maritime resources and their utilisation in the context of the blue economy, explores the main challenges hindering the sustainable development in this sector and identifies the key policy reforms and strategic actions needed to promote a sustainable blue economy in Pakistan. It posits that the underutilisation of maritime resources, exacerbated by challenges such as overfishing, outdated infrastructure and

bureaucratic bottlenecks, ineffective coastal management and strategic planning, can be mitigated through comprehensive policy reforms.

Pakistan's sustainable maritime development is analysed using Porter's Diamond Model and Barry Buzan's sectoral approach. These frameworks provide a comprehensive view of the economic, security, environmental, and social dimensions essential for understanding and promoting maritime potential.

Why Transition to a Sustainable "Blue Economy"?

The ocean economy can, therefore, be explained as serving the role of a parallel economy of Pakistan since Pakistan's territory consists of a large part of the ocean land area. The 'blue economy' concept marks a clear shift away from the extractive-brown economy analogy, where the ocean was conceived merely as a reservoir of resources to be harvested and a dumping ground of waste. As the Economic Intelligence Unit defines it today, the blue economy concept means the transition to a post-era of a more effective and sustainable approach to using resources more sensibly and less detrimental to the environment[3].

The shift towards the sustainable blue economy is thus necessitated by the quests for food security, environmental preservation, ecological integrity, and the practical implementation of technological advancements. Modern challenges, including the growth of cities, standardised production and climate change, have all threatened the marine environment with the potential to alter its natural responsibility of maintaining carbon levels and ecological balance. Climate change through global warming has caused a domino effect with impacts such as melting of glaciers, warming of the oceans, abnormal weather conditions, destruction of marine life and habitats, and food insecurity, among other complications. However, plastic pollution escalates these complications; about 8 million metric tons of plastics annually are fed into oceans. This work by environmentalist Al-Gore foresees that thirty years from now, the volume of plastic in oceans may be heavier than the volume of fish captured.

Overfishing and habitat destruction are other factors that exert pressure on marine ecosystems. Fishing and excessive use of fertilisers have caused massive destruction to the fish stock and aquatic ecosystem. The penalties are severe, with the world's wildlife population shrinking by 40% over the past 40 years, with minke whales and bluefin tuna among them.

Solving these complex issues calls for better management of ocean resources for present and future generations. Therefore, marine biodiversity acquires a strategic significance as a fundamental food source. However, abusive exploitation of the resources not only threatens aquatic life but also threatens world food security. However, there is still some light at the end of the tunnel because of high recovery rates when marine habitats are protected.

The demand for food security, recognised by the United Nations and global leaders as the central problem of the twenty-first century, increases the pressure on ocean resources. Overfishing, coupled with issues like ocean grabbing, where small-scale fishermen are sidelined by policies which promote large-scale fishing, complicates these problems. Such practices often do not follow sustainable business practices and damage the environment.

The ocean economy is also quite complex as it involves various aspects and sectors of development. While the ocean has historically been a vital source of livelihood, poor policies, political interferences, capacity-building measures, and lack of awareness regarding environmental hazards have engendered social, economic, and ecological repercussions.

Prospects for Pakistan

The Blue Economy has vast potential for Pakistan's future development, providing an alternative path for growth through the efficient use of marine resources.

Most notably, utilising marine and aquatic life, including fish and mangroves, can yield high returns. Even though the fish industry is currently valued at around USD 3 billion in Pakistan, there is a great potential for fish production being explored, mainly because of the use of crude fishing techniques, lack of responsible fishing and ecological degradation resulting from unlawful fishing activities. To overcome these challenges, it is essential to utilise control mechanisms such as PMSA to regulate and contain illegal activities and focus on developing deep-sea fishing fleets and upgraded processing plants. Marine culture, for instance, is still an upcoming area which, by innovation, can offer other income outlets along the coasts[4].

Further, the conservation, preservation, and restoration of mangroves address ecological concerns and have numerous revenue-generating prospects as a

facility for maritime tourism. The overall increase in the mangrove area has been achieved through combined initiatives with the Pakistan Navy, and it has opened employment opportunities for thousands of people residing in the Indus Delta. Thus, mangrove rehabilitation has been part of the government's 'Ten Billion Tree Tsunami' program.

Moving on to non-living resources, it would be correct to say that Pakistan has a significant maritime potential regarding oil and gas and deep-sea mining. However, exploiting these resources presents challenges as it will require extensive technological advancement and cooperation with international partners like the China Geological Survey (CGS). Measures like acquiring an Oceanography Research Vessel (ORV) or scientific explorations along with the CGS are some efforts to mitigate these challenges and unlock the economic potential of non-living resources[5].

Institutional and Political Delays

Despite Pakistan's enormous potential in sea exploration and production, the activities have not advanced significantly beyond the exploration of the fishing and shipping industries. Although the policy documents related to these sectors can be found at provincial and federal levels, it is interesting that no single "Blue Economy" policy document is currently available. However, 2020 has been declared the year of the Blue Economy. Within the shipping sector, multiple departments and ports, including the Pakistan National Shipping Corporation (PNSC) and various port authorities, operate under the guidance of policies such as the Merchant Marine Policy (2001) and its subsequent amendments. However, despite policy objectives aimed at attracting private sector investment and reducing the national freight bill, outcomes have been lacking, with Pakistan's freight bill continuing to rise. Likewise, the fishing sector is regulated under provincial and federal laws. At the same time, the Deep Sea Fishing Policy was established in 2018 and divides the coastal regions into zones. It aspires to achieve targets such as poverty and food insecurity. Despite these policies, the fishing sector holds only 1% of the GDP, a significant practice-policy gap.

These gaps are compounded by institutional and political logjams, which slow down the process of policy enactment. For instance, the procedures for ship registration are time-consuming and tedious when dealing with the Mercantile Marine Department[6]. While Panamanian business registration platforms provide a fast and easy method to register a business online or through an agent, Pakistan

has traditional methods such as manual name approval and elaborative documentation[7]. Also, the Mercantile Marine Department needs more trained staff to facilitate the registration processes and do it effectively and quickly. As much as the department would be handling several obligations by the Ship Registration Ordinance of 2002, the number of employees in the department is 42, and their operations need to be computerised. The absence of capacity building and training enhances these procedural inefficiencies that call for immediate reforms in the institution and modernisation in the department.

Fishing thus plays a critical economic role in the lives of those living in the coastal regions of Pakistan by offering a source of income, food, and exports[8]. In Sindh and Balochistan, the coastal areas, fishing is part and parcel of the local communities, where women are primarily involved in knitting nets, a time-honoured tradition. The economic profile of the gender disparities was highlighted according to the Occupational Employment Survey of Pakistan by the Sustainable Development Policy Institute (2009), which shows that 68% of women work in the agriculture and fishery sector while 32% are men[9]. The nylon nets brought by the Deep Fishing Policy for a better catch have eventually distorted traditional fishing and hurt women's economic contribution. Although effective in catching smaller fish, these nylon nets pose sustainability challenges and have lost alternative income sources for coastal women.

Applying industrial fishing techniques and the continued intrusion of foreign trawlers also add to the socio-economic challenges fishing communities face, restricting their ability to find productive and sustainable means of earning a living. Earlier, there were times when many fishermen and women were required to weave cotton nets to earn additional income. Yet, prohibiting traditional nets without proper policy means of livelihood has made them financially vulnerable[10]. Further, the lack of a sound policy structure has encouraged cutthroat competition in fishing activities, which was once a vocational hobby and has become commercial. As a result, such exploitative practices have made the resources scarce and the marine life population measly.

The persistence of unsustainable practices, such as the continued use of banned nets in some areas, emphasises the need to find policy alternatives to address sustainability and socio-economic development issues. Coastal regions are faced with complex problems that require relevant and practical solutions that can

only be provided by a participatory approach, which includes the involvement of all stakeholders, including the local people.

Stewardship of ocean resources in Pakistan's maritime jurisdiction is not simple, as it entails the interaction of various actors at the federal and provincial levels. Resource distribution and users' permissions have several dimensions and uses that vary nationwide, making ocean resource management chaotic. In this complex context, the decisive factor for implementing policies that contemplate the diverse needs of the sectors involved and allow for a fundamental continuity in managing the ocean's resources appears to be the formulation of participative and inclusive policies.

It is noted that stakeholder engagement is central to the contributions made towards policy change, including the development of a sustainable blue economy. Stakeholders range from federal and provincial resource managers to policymakers, fishermen and traders, the coastal people of Sindh and Balochistan, private investors, maritime organisations like the Pakistan National Shipping Corporation (PNSC), and environmental groups.

Among these stakeholders, the fishing communities and residents of fishing villages can be seen as essential actors in the fishing policy field since their sources of income are tied to this sector. Fishing is the primary source of income and livelihood for many people, and other occupations, such as education or different forms of employment, rarely replace it. These communities must be actively engaged in policymaking and policy development because the information they possess is vital to affecting policy implementation and outcomes.

Failure of stakeholder involvement is one of the most conspicuous policy implementation challenges. In the ocean economy, through engaging the participants and using input from the different participants, policymakers can craft policies that ensure social, economic, and environmental sustainability within the ocean economy.

When considering policies, one should never forget that policies cannot be realistically measured merely by how they were developed. Instead, it is the implementation of such policies that largely determines whether or not the policies will be effective or not. When it comes to policy implementation, what

becomes evident is several very diverse, interrelated, and complex factors that can influence the policy and its efficiency[11].

Academic discourse has identified several factors contributing to policy implementation challenges in Pakistan. These factors include corruption, bureaucratic red tape, limited human and financial resources, overly ambitious policies, inadequate policy evaluation and monitoring mechanisms, lack of stakeholder engagement, and absence of a centralised vision[12].

For instance, the Pakistan Deep Sea fishing policy and provincial policies in Sindh and Balochistan have mandated the prohibition of small mesh nets and addressed the issue of Illegal, Unreported, and Unregulated (IUU) fishing. Despite these regulations, such practices persist in the region, highlighting discrepancies between policy intent and on-ground realities. In this context, the crux of the challenge lies not in policy formulation but rather in the effective enforcement and implementation of regulations. Similarly, the shipping policy in Pakistan has yet to achieve its intended objectives, signalling a gap between policy formulation and practical outcomes.

Socio-ecological Issues

Marine transportation is the backbone of global trade, facilitating the movement of vast quantities of liquid and dry cargo through ships and containers each year. While hailed as an efficient mode of transportation in business, marine transport also significantly contributes to marine pollution. Accident oil spills, ballast water discharge, greenhouse gas emissions, air and water noise pollution, and improper waste disposal pose grave threats to oceanic species and biodiversity.

In Pakistan, the shipping industry emerges as a primary source of chemical discharge, with Karachi, a bustling hub of shipping and fishing activities, grappling with severe pollution issues. Industrial waste and chemical discharges from ships exacerbate the pollution problem, further endangering marine life[13]. Plastic waste, in particular, accounts for approximately 60% of litter found along the seashore, according to the WWF. Unsustainable activities like mineral extraction further compound the ecological challenges, leading to a decline in fish stocks, as highlighted by the IUCN.

Despite international conventions to curb marine pollution, Pakistan urgently needs a comprehensive national action plan to address this issue. Karachi, ranked 12th on the World Air Quality Index, grapples with deteriorating air quality, adversely affecting fishermen's livelihoods and exacerbating the decline in fishing stocks.

In the fisheries sector, the focus on sustainable practices is overshadowed by illegal and unsustainable fishing methods, exacerbating the decline in fish stocks and perpetuating poverty among coastal communities[14]. Mangroves, which contribute to the balance of ecosystems and are valuable sources of fish and other resources, are cut down due to increased population and people cutting trees without permission. Therefore, urgent attention needs to be given to integrated approaches involving local stakeholders.

Policy implementation must tackle these challenges and ensure organisational accountability across sectors. Citizens must demand accountable policy execution and implementation from public administrators and politicians. Inadequate accountability measures contribute to marine pollution, industrial waste discharge, and other threats to aquatic biodiversity. Aligning fishing and shipping policies with the principles of the blue economy, focusing on socio-economic and ecological sustainability, is paramount for fostering a resilient marine ecosystem in Pakistan.

Technological Advancements Issues

The advancement of technology stands as a cornerstone for the future trajectory of the ocean economy, holding immense potential to drive innovation and ensure human prosperity. In light of this, oceanic economies worldwide have already embraced various advancements such as aquaculture, biotechnology, marine mapping, and sea transportation. James Bellingham, Director at the Woods Hole Oceanographic Institution, underscores the pivotal role of technology in ocean exploration, highlighting the significant contributions of robots to future advancements in the ocean economy[15]. The Organization for Economic Cooperation and Development (OECD) further emphasises the critical role of science, technology, and innovation as significant drivers of the ocean economy[16].

In addition to existing technologies, myriad advancements, including satellite technologies, big data analytics, subsea engineering, and physical sensors,

are poised to revolutionise various ocean economy sectors. These technologies, united by a common goal of promoting economic and environmental sustainability, hold the potential to unlock significant value, as evidenced by the European Union's assertion that maritime technology has generated an additional value of $21 billion net income solely in the shipping sector[17].

However, these are still in their developmental phase globally, and Pakistan is hardly an innovator. The problem in Pakistan is that in terms of research and development investment, it remains at the lowest in the South Asian region, and its competitiveness ranking is comparatively low per the global competitiveness indices[18]. The lack of technology endowment weakens the identification, exploitation, and stewardship of the country's marine resources, particularly in the fishing and shipping sectors, which operate without adherence to sustainability principles.

It is, therefore, essential to address some of these technological shortcomings in the development of the ocean economy in Pakistan. This paper thus concludes that funding for the development of marine technology is crucial for tapping into the resources that the seas and oceans provide and for managing these resources. In addition, the application of the Internet of Things (IoT), extensive data analysis, and digitalisation enablers can unlock the real potential of turning traditional ports into smart ports to increase port productivity, decrease cost baseline, and attract cross-border investment[19]. Pakistan needs to embrace digitalisation that can help with formalities like registration and clearance of ships. This will help make this market more competitive and propel economic growth in the shipping industry.

Also, the lack of gadgets to track fish catches compounds problems like overfishing, threatening marine resources' viability and communities relying on fishing. Technological tools like electronic monitoring systems (EM) and GPS tracking might yield significant information on fishing activities and help with sustainable management initiatives. Additionally, devices like Turtle Exclusive Devices offer promising avenues for mitigating overexploitation in the fishing sector, thereby safeguarding coastal communities and promoting ecological balance.

Public-Private Partnership

The blue economy is a vast area that covers various financial regions and policies; thus, management is a challenge requiring multiple stakeholders' cooperation. Hence, in countries such as Pakistan in the global South, sustainable management of oceanic resources can only be achieved through a synergy between the private actors and state authorities. Most of these countries depend on international donors to fund projects related to ocean development. In most cases, the funds can often be unpredictable, hence the requirement to find sustainable long-term funding sources. Understanding the importance of private funding in the blue economy, the International Union for Conservation of Nature (IUCN) initiated its private sector coalition program in 2016 to help states in the conservation of ecosystems. At the national level, the government relies on the private sector to manage ocean resources and subsequent economic activities to foster growth, eradicate poverty, and generate employment. However, realising these development goals requires innovation, technology, and stable financing mechanisms, necessitating collaboration between public and private entities[20].

While South Asian maritime nations like India, Sri Lanka, and Bangladesh actively encourage private sector investment in the blue economy, Pakistan faces challenges in attracting private capital. Despite offering incentives in its shipping policy to attract private investment, Pakistan has yet to secure significant private funding in the shipping sector, contributing to a low share of private investment in the country's GDP. Bureaucratic hurdles and corruption hinder private investment, as evidenced by cumbersome registration processes and customs procedures. The outdated infrastructure and lack of modern technology in departments such as the Mercantile Marine Department further impede investment[21]. These challenges must be overcome, mainly for Pakistan to take advantage of the shipping sector and significantly cut costs incurred on freight bills.

Another precondition for the process of sustainable natural resource management is the capacity development of local communities. The indigenous people are primarily responsible for the preservation of ecosystems. However, poor training and limited knowledge restrain their capacity to observe the conservation measures. Local fishermen in Pakistan still utilise prohibited fishing nets because there are no other options, and most have yet to learn why those fishing nets are not permitted in the first place. Preventive programs should include the development of sustainable fishing practices, technical expertise, and

other sources of income so that the coastal communities will not resort to unsustainable fishing[22].

Also, it's imperative to overcome 'sea blindness,' that is, the political and business community's inability to comprehend the extent of the marine resources in the country to encourage private investment. Astonishingly, most of these do not know the government's vast potential in marine-related activities as it has a long coastline stretch. Co-operative partnerships are central to raising awareness of sustainable development in fields as diverse as fishing, shipping, tourism, and renewable energy. Therefore, to create employment for the nation's populace and, at the same time, ensure sustainable exploitation of ocean resources, Pakistan needs to tap into private capital and ensure more people understand the opportunities that the ocean economy presents.

Recommendations

To fully leverage our maritime potential and align with the principles of Sustainable Development Goals (SDGs), several recommendations are proposed:

- Form a blue economy cell directly operated from the prime minister's office and constituted of concerned marine professionals, ministers, and other influential industrialists. This cell will facilitate the coordination of the blue economy activities between the government and the private sector players within the maritime sector.
- The Pakistan Bureau of Statistics should officially adopt gross Marine Product (GMP) as a new tool for estimating and forecasting national products and evaluating the maritime industry's actual role in the country's economy.
- Strengthen the capacity of the Ministry of Maritime Affairs (MoMA) by recruiting subject matter experts and naval officers with expertise in the maritime domain, providing technical and professional assistance for effective policymaking and implementation.
- Focus on human resource development and skills enhancement for local fishermen and workers in the shipping industry through targeted initiatives.
- Establish vocational training institutes in coastal towns/cities such as Gwadar, Pasni, Ormara and Shah Bandar to impart modern fishing skills and techniques.

- Establishing maritime technology institutes in coastal cities like Gwadar, Pasni, and Gadani aimed to develop specialised maritime technology and operations skills.
- Enhance the capabilities of the National Institute of Oceanography (NIO) to monitor and assess the state of fish stocks in our Exclusive Economic Zone (EEZ) and Continental Shelf, aligning with the Food and Agriculture Organization's Code of Conduct for Responsible Fisheries 1995. Collaboration with provincial Fishery Departments is essential for comprehensive monitoring and assessment.

Conclusion

The transition to the blue economy concept is critical for socio-economic development in Pakistan. Pakistan has a rather advantageous geographical location, possessing a vast expanse of ocean area and a strategic position at the crossroads of trade routes. Yet, extensive problems exist regarding the effective exploitation of nautical assets. Barriers such as policy implementation gaps, bureaucratic obstacles, socio-ecological issues, technological deficiencies, and the need to interface with the private sector show that this shift may be challenging. There must be inter-sectoral cooperation and collaboration among government departments, policymakers, private businesses and communities to overcome these challenges.

References

[1] Munib ur Rehman, "Potential, Challenges, And Prospects For Pakistan's Blue Economy," *Journal of Maritime Logistics* 3, no. 1 (2023).

[2] Urooj Aijaz and Hassan Daud Butt, "Bolstering Sustainable Growth through Blue Economy," *Pakistan Journal of International Affairs* 4, no. 1 (2021).

[3] Camilla Novaglio et al., "Deep Aspirations: Towards a Sustainable Offshore Blue Economy," *Reviews in Fish Biology and Fisheries* 32, no. 1 (March 1, 2022): 209–30, https://doi.org/10.1007/s11160-020-09628-6.

[4] Sehrish Qayyum and Abdur Rehman, "Investing In Blue Economy: Parallel Options for Economic Growth," *ISSRA Papers* 14 (2022): 31–49.

[5] Ministry of Maritime Affairs, "Transhipment," 2020, https://moma.gov.pk/SiteImage/Misc/files/Draft%20Working%20Paper%20-%20Transhipment%20by%20Ministry%20of%20maritime%20 Affairs%20_(27_08_2020).pdf.

[6] Jihong Chen, Hailang Cui, Xingxuan Song, and Jinlong Yang. "The Development of Ship Registration Policy in China: Response to Flags of Convenience." *Marine Policy* 83 (2017): 22-28.

[7] P. Attorneys. "Panama Maritime Vessel Registration - Panama Offshore Legal Services." 2021. https://www.relofirm.com/panama_maritime_vessel_registration/.

[8] Syed Babar Hussain Shah, Noor Muhammad, Syed Najeeb Ullah, and Sobia Nazir. "An Economic Analysis of the Fisheries Sector of Pakistan (1950-2017): Challenges, Opportunities and Development Strategies." *International Journal of Fisheries and Aquatic Studies* 6, no. 2 (2018): 515-524.

[9] SDPI. "Pakistan: Country Gender Profile." 2009. Retrieved from http://www.sdpi.org/research_Programme/human_development/country_gender_profile.

[10] Rubina Saigol. *Women's Empowerment in Pakistan: A Scoping Study.* 2011

[11] Horst W.J. Rittel and Melvin M. Webber. "Dilemmas in a General Theory of Planning." *Policy Sciences* 4, no. 2 (1973): 155-169.

[12] Sirajul Haq. "Public Policy Process in Pakistan: Key Causes of Public Policies Failures." *Journal of Economic and Social Thought* 2, no. 2 (2015): 127-131.

[13] Ta-Kang Liu, Meng-Wei Wang, and Ping Chen. "Influence of Waste Management Policy on the Characteristics of Beach Litter in Kaohsiung, Taiwan." *Marine Pollution Bulletin* 72, no. 1 (2013): 99-106.

[14] Shaheen Rafi Khan and Shahrukh Rafi Khan. "Fishery Degradation in Pakistan: A Poverty–Environment Nexus?" *Canadian Journal of Development Studies/Revue Canadienne d'études Du Développement* 32, no. 1 (2011): 32-47.

[15] Jennifer Saunders. *The Role of Research and Technology in the Changing Ocean Economy: Proceedings of a Workshop—in Brief.* 2020.

[16] OECD. "Science, Technology and Innovation in Tomorrow's Ocean Economy." In *The Ocean Economy in 2030*, 2016.

[17] European Union. "Blue Sectors Contribute to the Recovery and Pave Way for EU Green Deal. European Commission." 2020. Retrieved from https://ec.europa.eu/jrc/en/news/2020-blue-economy-report-blue-sectors-contribute-recovery-and-pave-way-eu-green-deal.

[18] UNIDO. "United Nations Industrial Development Organization MVA Database." 2020. Retrieved from https://www.unido.org/.

[19] UNESCAP. "Digitalization and Port Productivity." 2019. Retrieved from https://www.unescap.org/sites/default/files/2.5.

[20] EIU. *Investing in the Blue Economy—Growth and Opportunity in a Sustainable Ocean Economy.* 2015.

[21] World Bank. "Improving Pakistan's Public and Private Investment." 2019. Retrieved from https://blogs.worldbank.org/endpovertyinsouthasia/improving-pakistan-s-public-and-private-investmen.

[22] D. Irving Hartoto, J.E. Ekawaty, and A. A. S. Subijanto. "Building Capacity for Mainstreaming Fisheries Co-Management in Indonesia." 2009.