Meals Through Maritime: Challenges and Opportunities of Pakistan's Fisheries Sector

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ABSTRACT:

This paper attempts to outline the potential of Pakistan's fisheries sector in supporting food security, its contribution towards economic development, and to tackling the emergent challenges of human security. The country is reasonably well endowed with a marine ecosystem, but there are strong barriers that face the full exploitation of fisheries resources. These are environmental burdens causing degradation; overfishing; and poor and inadequate infrastructure. The objective of this research is to assess the potential of Pakistan's fisheries sector in contributing to food security and economic development, while examining the key challenges of environmental degradation, overfishing, and inadequate infrastructure, and to propose policy recommendations through the lens of human security theory and regional comparative experiences. This research discusses the importance of increasing contributions to reducing food insecurity in more than 20% of the population through provision of a sustainable source of protein and improving livelihoods in coastal communities. Comparative successes include that of Bangladesh and Sri Lanka, where aquaculture has been integrated into their economies and improved food security. The research will also draw findings from the context of Barry Buzan's human security theory to set out the issues of stability related to the welfare of humankind in regard to food, the economy, and environment. Using qualitative research techniques, expert consultations, and secondary data, this paper concludes into action initiatives and policy recommendations on the issues the fisheries sector of Pakistan faces.

Key words: *Pakistan fisheries sector, Blue economy, Sustainable fishing, Food security, Aquaculture*

INTRODUCTION

Pakistan's fisheries sector has an important but somehow underutilized capacity to help solve the burgeoning problems of food security and human welfare in the country. Its coastline runs for over 1,001 kilometers with an Exclusive Economic Zone (EEZ) of 290,000 square kilometers. Thus, there lies a sustainable solution to the scourge of scarcity of food here, particularly in coastal and rural areas

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where protein deficiency is high. Although the fisheries sector is important, its full potential has yet to be realized owing to a variety of challenges ranging from overfishing, environmental degradation, incomplete infrastructure, and inefficient governance.

Fisheries play a very important role in Pakistan's economy and food security. To the millions of people who live on the coast, fish is an important source of protein; but comparatively, consumption of fish is very low in Pakistan as compared to the rest of the world. Drivers are misconceptions about the nutritional values it brings, less linkage through supply chains, and generally low information sharing about its advantages. Also, the two neighboring countries of Pakistan, Bangladesh and Sri Lanka, used their sea resources. The country has not fully exploited its fisheries resources, and it has somewhat neglected the necessity of sustaining and investing in the sector.

This research article was based on the use of qualitative research methodology and studied the Pakistan fisheries sector based on standard content analysis of both primary and secondary data. The study has heavily relied on the utilization of a broad spectrum of sources drawn from peer-reviewed research papers, opinion articles, scholarly books, online journals, and opinion articles from expert people sourced from reliable websites. To understand the sector, I also had to refer to national and international documents, important reports published by organizations like FAO and World Bank, and policy briefs. Interviews and consultation with academics and practitioners in the field of maritime studies, fisheries management, and food security were conducted so as to gather the opinions of experts and relevant information concerning Pakistan's landscape of fisheries.

An important in-house consultation was carried out with experts from fisheries and human security areas for discussion and synthesizing critical findings from the paper. It, in itself, helped fine-tune the conclusions from the paper and feed into actionable policy recommendations. Inputs from the experts gave valuable insights about governance frameworks and strategies that might enhance the effectiveness of Pakistan's fisheries sector related especially to food security, economic sustainability, and environmental conservation. The paper uses a variety of credible sources, professional opinions, and case studies to support an overall yet multi-dimensional view about issues related to Pakistan's fisheries and the prospect of suitable answers to solve those problems. Overall, this paper shows that the methodology applied is all-rounded and in a well-balanced manner; the author has used diverse data sources combined with expert analysis to produce well-founded conclusions and recommendations. In this manner, it adds to the broader discourse of fisheries management, food security, and the role of the Blue Economy to improve sustainable development for Pakistan.

LITERATURE REVIEW

Pakistan's Maritime and Fisheries Potential

Fisheries sector is playing dual role in economic dimensions as well as in food security dimensions. Pakistan has been producing around 700,000 metric tons of fish

during fiscal year 2022-23 out of which marine sources accounts for 475,000 tons. Although it still constitutes a minor source of proteins in Pakistan compared to the rest of the world—where per capita fish consumption is only about 2 kg while the average for all of the world is 20.5 kg—there it plays an important role in the diet in coastal regions where it contributes to filling nutritional gaps.

The sector also is an important sector of foreign exchange. Seafood export accounts for the sum of $ 500 million from 2022 - 23 and the exports majorly were to the markets of the United States, China, the European Union and Southeast Asia, but only it contributes 0.5 % to the national GDP, which is a very small amount of money in comparison with its potential.

However, outside its economic context, fishery is central in addressing food and human security of the nation by making good protein sources available. Already above 20% for Pakistani households, fish serves an available substitute for more expensive cuts to use as a protein product; it's indispensable within such low-income families, with greater rural communities. However, it gives basic nutrients like omega-3 fatty acids and vitamins that are mainly in rare supply across many sources of proteins and thus an important part in the fight against malnutrition and human wellbeing. Direct contributions to human security seem to appear for coastal communities in diminishing malnutrition and supporting health mainly in communities with difficult access to other sources of proteins.

It would be beyond direct nutritional security; it would involve fuller dimensions of economic, environmental, and social security. For instance, the impacts of fisheries on Pakistan's coastal economies in terms of general, sustainable goals and objectives and fisheries management under Pakistan's Blue Economy initiatives focus on regulated fishing zones, catch limits, and seasonal restrictions. These practices under the Marine Fisheries Department and the Food and Agriculture Organization (FAO) are for the conservation of biodiversity and to make resources sustainable for long-term food and economic security of the coastal populations. In this manner, fisheries contribute not only to the food supply but also to economic stability, job security, and the health of marine ecosystems, all in indispensable parts of human security.

Human security theory by Barry Buzan helps improve the concept by broadening traditional conceptual definitions of military threats into those individual-related quality of life and community-based well-being issues. His approach articulates the themes related to scarcity of resources, denial of food, ecological instability, and poverty as the source of insecurity. Implementing Buzan to the sector fisheries in Pakistan, food security stands out as playing a role in human security: access to fish as a low-priced source of protein supports societal resilience by cutting down malnutrition and poverty, thus reducing risks of instability and unrest in that society. Sustainable fish harvesting gives both food and human security strategic concepts because sustainable fisheries support health both in the communities and ecosystems. In this regard, Pakistan's strategies toward sustainable fishing sector of the country generally concentrate on Buzan's even broader definition of human

security. That is to say, along with immediate availability of food, such livelihoods securing health give them long-term stability while protecting the environment.

Challenges to Fisheries sector of Pakistan

1. Illegal Overfishing and Weak Regulation Compliance

The greatest challenge in the Pakistani fishing industry is overfishing, mainly at the Sindh and Balochistan coasts, where fishing regulations are quite weak. Seasonal prohibition and catch limits have been imposed for sustainable harvesting, but these prohibitions are hardly followed in this regard because surveillance is inadequate and enforcement agencies lack sufficient resources. This unregulated fishing has resulted in the steady decline of the fish over the last decade. Most commercially important species of fish and shrimps are facing alarming levels of depletion. The report submitted by the Marine Fisheries Department underlines the need for a few regulatory reforms since the depletion of fish populations not only disrupts the marine biodiversity but also represents a risk to the living of people residing in those areas dependent on fishing activities.

2. Coastal Waters Pollution

Industrial and urban pollution also forms another serious threat to the fisheries of Pakistan. Plastic wastes, untreated sewage, and chemical discharges along the coastline, particularly around Karachi and other urbanized centers, severely affect the coastal waters. Such discharges degrade important marine habitats like mangrove forests and coral reefs. Especially mangroves act as nurseries for many species of fish and destruction of them has an immediate adverse effect on fish stock. These pollutants enter the food chain of the marine environment and thus threaten human health from contaminated fishes. Additionally, the growing population of the country with associated industrialization puts pressure on coastal ecosystems.

3. Climate Change and Environmental Pressures

This has led to challenging problems, which are highly complex and create an added layer of complications on the existing environmental concerns that the fisheries in Pakistan face. Thus, sea surface temperatures and ocean acidification have altered fish habitats' migration routes, breeding cycles, and health. Climatic change and extreme weather patterns such as tropical cyclones and sea level changes cause harm to fishing activities and infrastructures in coastal regions. This interplay of environmental factors increases the vulnerability of fish stocks, thus making it even more difficult for small-scale local fishers to have predictable stable levels of income and for the fisheries industry to provide reliable food supply chains to the nation. Uncertainties of these climatic changes have already caused unstable outputs of the fishery, complicated further the livelihoods of the communities dependent on the fisheries sector.

4. Infrastructural Deficiencies and Technology Gap

Infrastructural deficiencies severely impact the fisheries sector of Pakistan that not only restrains the sales of fish at the national level but also the export avenues of this commodity. There seems to be a great gap in cold storage, processing plants, and an efficient supply chain. Post-harvest losses are extreme, which makes fish products

impossible to meet international markets' quality specifications. It remains one of those sectors which have the potential but could not contribute properly to Pakistan's economy. The limitation in modern fishing technologies and monitoring systems is also preventing growth of the sector in an increased sustainable manner following the standards at the international level. If these gaps remain open on technological and infrastructural dimensions, the fisheries sector in Pakistan cannot fulfill its immense potential toward both economic activities and food security for decades ahead.

Comparative Analysis of Fisheries in South Asia

Bangladesh

Bangladeshi fisheries are on aggressive growth trajectory in South Asia, especially in aquaculture, where production has scaled up to 2.56 million tons in 2022. Such growth is highly attributed to government policies based on community-based fishery management, subsidies, and public-private partnerships where efficient and sustainable fishery production has been witnessed. Being about 56% of the whole fish production of the country, aquaculture is one example of well-organized community fisheries. Apart from contributing to the national economy, and alongside the sector providing for the low-income communities mainly in the rural areas at an affordable protein cost, the sector contributes rather significantly to the national economy and generates about 3.57% GDP. In addition, Bangladesh has established very tight specifications for sustainable harvesting. Success has been supported through collaborations by the likes of the FAO and World Fish. Such collaborations have ensured that food to Bangladesh' growing population is well guaranteed and preserved marine ecosystems simultaneously. Great investment into infrastructure, particularly in cold storage and processing facilities that reduce post-harvest losses that maximizes output, further explains the success of aquaculture in Bangladesh.

With the thrust now channeled toward fish as a relatively affordable source of protein for rural consumers, the government has played true to its heart, keeping at the center of its anti-malnutrition strategies. This with proper strategies and management has allowed Bangladesh to set an example of how food security can be balanced with economic growth-one that would be perfect for South Asian nations to study in greater detail.

Sri Lanka

The Sri Lankan fisheries sector is smaller in scale than Pakistan's but seems more focused in its efforts to make the most of relatively scarce resources. Sri Lanka has a much smaller EEZ compared to Pakistan, and has invested greatly in infrastructure, coupled with government subsidies to support its domestic as well as export-oriented fish markets. The staple diet in Sri Lanka is fish, and the intake of fish has been considerable to meet the daily protein needs of the coastal as well as rural communities. In addition to this, the Sri Lankan government had also invested into cold storage, processing plants, and logistics that have improved the quality of seafood consumed locally and also exported. To complement the above interventions supported by the government, artisanal and small-scale fishers who are the back-bones of Sri Lanka's fisheries economy have incentives available to them.

The sector has had international partnerships and aid, which strengthens local capacities and avails modern equipment to improve the productivity of the sector. The fisheries sector in Sri Lanka supports local food security besides generating foreign exchange through export, which reinforces economic resilience in coastal regions. Sri Lanka focused its attentions on infrastructures as well as sustainable practices in a more resilient fisheries industry feeding the local market and responding to international demand. This comparative approach toward Bangladesh and Sri Lanka will continue to elicit potential best practices in management, public investment, and sustainability-focused policies for food security and economic resilience through the fisheries sector.

Analysis: Overcoming Pakistan's Problem in its Fisheries Sector

The fish sector of Pakistan will play the most significant role in enhancing food security and economic growth, which shall, in return, increase the standard of living of its people, especially the coastal regions and rural areas. This has created or merged many opportunities for the sector; however, it has also encountered several challenges that the sector has not been able to take full advantage of. The analysis reports strategies needed to overcome the main challenges facing Pakistan's fisheries sector with a multi-pronged policy of reforms, technological innovations, infrastructure development, and international cooperation now necessary for Pakistan to overcome the main challenges facing its fisheries sector.

1. Counter-Overfishing and Sustainable Fisheries Management

Overfishing has been critical in the coastal regions of Sindh and Balochistan. Besides, implementations of regulations, such as seasonal bans and a catch limit imposed and prohibition to fish zone, are not strictly followed. This brought a downfall in the commercially important species of fish to devastate ecological as well as livelihood pattern of the fisherman. Coordination of Pakistan's Marine Fisheries Department with international organizations that might work with FAO and World Bank to avail effective data collection, stock assessments, and fisheries management practices would improve the implementation of existing regulations with enhanced monitoring mechanisms curbing over-fishing. Science-based data would also help in decision-making to arrive at sustainable catches that may not let over-fish but recover depleted stocks. It would also adopt Bangladesh's CBFM systems, among others. The system would enable the engagement of the local communities in regulating their fishing practices, monitoring resources, and enforcing conservation measures. The CBFM system combines top-down regulation and bottom-up involvement towards better compliance and better conservation. Offshore, there are establishment of Marine Protected Areas (MPAs) in the coasts of Pakistan. These will act as primary breeding grounds of fish, such as coral reefs and mangroves, wherein these species breed. The model MPAs has been successfully utilized across other nations; for example, Sri Lanka and India through developing biodiversity as well as time to time increase in fish stocks. An expansion of MPAs with strengthened enforcement should rehabilitate the fish populations, build longer-term sustainability of the fisheries resources and create more stable sources of food and income for people living in

coastal areas.

2. Control of Pollution and Environmental Degradation

Severe industrial, agricultural, and urban wastes pollution is steadily deteriorating this marine ecosystem, especially at the coasts of Karachi, Sindh, and Balochistan. The unchecked discharged sewage, plastic wastes, and chemical pollutants especially degrade major fish habitats such as mangrove forests and coral reefs and thereby eventually reduce fish stocks and compromise the health of the ecosystem while threatening the quality of fish for consumption. Pakistan needs strengthening in environmental laws. The state will have to be much more careful in enforcing statutory measures controlling industrial and urban pollution. One very important step could be integrating coastal zone management frameworks integrating government agencies, local communities, and industries into regulating the waste disposal practices and fostering environmentally friendly practices. Begin plastic waste recycling and industrial effluent treatment before the former is released into the sea. Collaboration would also be initiated with international organizations like the United Nations Environment Programme (UNEP). Pakistan needs habitat restoration of critical ones like mangroves and coral reefs, among others. Mangrove restoration is already being done with the Sindh Forest Department; these programs may be expanded over larger areas. Some reports show that while fully formed healthy mangroves constitute a big nursery ground habitat for rearing and breeding lots of fish species, sustainability in fishing operations is assured 5. Mangrove restoration combined with measures of pollution prevention shall further strengthen resilience within populations and in general the health of marine ecosystems.

3. Climate Change and Adaptation Measures

All these environmental changes are already impacting the yields of fishery enterprises negatively such that small-scale fishermen can no longer predict at what date the fishing seasons are; hence they fail to have a sure source of income. This threat encompasses variations of sea temperatures, ocean acidity, and extreme climatic conditions that might alter the breeding cycle, migrations, and fishing seasons. Climate change adaptation should be integrated with scientific research aimed at understanding and mitigating impacts of changing climate conditions on marine ecosystems. Pakistan should invest in climate-smart aquaculture, which entails designing fish farming practices to minimize their vulnerability to extreme climate factors, namely temperature fluctuations and ocean acidification. Some of the research institutions will, therefore, have opportunities to collaborate with some of the international organizations in various research issues that involve concerns on issues regarding climate to further enhance an adaptive strategy and a sustainable system of aquaculture proposed in a Marine Biology Research Centre at Karachi.

In addition, Pakistan would invest in early warning systems for its fishermen who would be informed about the changed migration pattern of fishes and unfavorable weather conditions. Early warning systems would enable the fishermen to better plan their efforts, thus saving them from fishing in hazardous conditions as well. Greater integration of climate adaptation into the Blue Economy would make the fisheries

sector stronger against changed environmental conditions.

4. Fisheries Infrastructure and Technology

Major infrastructural issues related to the country's fishery sector pertain to cold storage, processing, and transportation. Post-harvest loses waste fish while at the same time reduce Pakistani seafood export competitiveness. Assurance systems on quality and refrigerated chains of supply push away most fishermen from selling fish internationally. Low applications of technology; for instance, monitoring of fish stocks leaves room to poor management which consequently reflects in low productivity emanates.

Pakistan would have to invest in modern fisheries infrastructures such as installation of cold storage facilities, transportation networks, and processing plants. Public-private partnerships can be used to source the funds required for the infrastructural projects; building cold chains that ensure proper preservation of fish from catch to consumer will be emphasized. Third, with investment in international quality standards processing plants, it would be easy to enter global markets, thereby raising export revenues and pushing up economic growth rates up.

Modernization of the fishing fleet of Pakistan through more efficient vessels with sophisticated fish-finding technologies like sonar and GPS systems will increase the productivity while minimizing wasted effort. Electronic licensing platforms for permits in the fisheries sector, catch reporting, and export documentation would further reduce redundancies and increase transparency in the fisheries sector. Advancement in technologies and infrastructures will significantly improve the competitiveness of fisheries in Pakistan and enhance food security through improvements in distribution and exports of fish products.

5. Public Awareness and Dietary Changes

Despite its long coastline where there is availability of fish, the Pakistanis consume much less number of fish products than what it could benefit from because of cultural myths and dietary patterns prevailing in the country. Instead, fish is considered as a "hot" food, while it should be consumed during cold months, thereby only consuming it when it is less abundant. This myth denies access to many people integrating fish in their diet, and other sources of proteins may not be accessed easily elsewhere especially in rural areas.

Public enlightenment programs should break some of the myths surrounding fish and enlighten the population on some of its nutritional values. Campaigns will be taken for spreading awareness on how fish is useful in ensuring well-being health benefits, such as a better heart and development of the brain, through the spread of its benefits that reduce malnutrition by getting out and talking, the government partnered with nutritionists and other health experts. Schools, community centers, and health care delivery structures could be the media used in passing the messages across, especially to the rural areas where the myths thrive the most 9.

In addition, as higher fish will be readily accessible to local value chains and will increase access to poor families, it will lead to greater consumption. The government support for fish subsidy schemes for poor families, besides the

government-initiated fish distribution schemes, will most likely bring malnutrition levels down and lead towards food security, particularly along coasts and other rural areas.

6. Cultural Perceptions and Dietary Trends: Fish in the Pakistani Diet

Fish consumption in Pakistan is surprisingly low, when compared to world averages, while considering that this country has abundant marine resources and fish is rich in nutrients. According to many Pakistani perceptions, fish is said to create "heat" inside the body and cannot be consumed during warmer days. This cultural misconception, based on traditional beliefs rather than scientific fact, has a profound effect on patterns of fish consumption and, therefore, its role as an everyday source of protein. Fish is thus eaten primarily in seasonal or winter diets and not year-round for food security and nutrition unless cooked as part of other types of diets.

Nutritionally, fish is a good source of high-quality protein, essential omega-3 fatty acids, vitamins, particularly vitamin D, and minerals, such as iron and calcium, that other protein sources rarely have. The consumption of fish has been closely associated with health benefits ranging from good cardiovascular health to developing healthy brains, therefore, overall well-being of the body. The FAO and WHO, among other organizations, underscore fish as being critically vital in a balanced diet, especially for countries with a deficiency in proteins.

Meat and poultry are staple elements of the Pakistani diet but are pricier and much less sustainable than that of fish. Fish is relatively inexpensive and accessible, particularly in coastal and riverine regions; this makes it a very useful buffer in terms of food security to low-income communities if it were embraced more widely. Public health campaigns to dispel myths and raise awareness about the health benefits of fish could be an impetus to change eating habits. Increased consumption can thus tap into Pakistan's rich fisheries resources also in reducing its reliance on imports of meats for nutrition, aside from concerns regarding food security also.

Conclusion

In the end, Pakistan fisheries have much potential toward overall food security, economic growth, and welfare of citizens along the coast. However, it still faces some challenges such as increased overfishing, pollution of waters, climate change, low and inadequate infrastructure, and socio-cultural barriers to increase fish consumption. To end these problems requires a multilateral approach, based on strong regulatory structures, increased community participation, new technological innovations and stronger awareness among people.

Pakistan must establish sustainable fishing practices, protected areas marine and should incorporate the local communities in the management of the resource to ensure long term health of fish stocks. Stronger regulations and concerted restoration efforts on critical marine habitats such as mangroves would help alleviate the mitigate effects of pollution and environmental degradation. Of course, climate change is also of critical importance, and fisheries sector needs resilient aquaculture, including financing early warning systems and scientific research. Improvement of infrastructure is basic in reducing post-harvest losses and enhancing the

competitiveness of fisheries in international markets. Development of cold storage, modernization of the fishing fleet, and advancements in technological practices will lengthen greater efficiency and productivity. Campaigns for public awareness that focus on the nutritional aspects of fish may orientally lead the people to consume more of it in order to increase their share in national diets.

With the principles of sustainability, innovation, and community-driven governance aligned with the fisheries sector, these challenges that Pakistan is facing will be overcome, unlocking the latent potential of the sector. Not only will this help the efforts at ensuring food security in Pakistan but also provide highly significant economic opportunities, meaning fisheries are the cornerstone of Pakistan's maritime strategy and national development. While such solutions will depend on the collaborative efforts of both the domestic and international sectors to help realize success, it will be Pakistan's fishery that emerges as a really vibrant and sustainable contributor to its future prosperity.

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