FOOD SECURITY COMPETITION FOR FISHERIES AND SEAFOOD IN THE INDIAN OCEAN REGION: CHALLENGES AND OPPORTUNITIES FOR PAKISTAN

By

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Dedication

With utmost devotions, I dedicated my whole work to my beloved and affectionate Parents, Sisters, Brother, Friends and Respected Staff of International Relations Department who have always been source of encouragement, knowledge, illumination and wisdom for me, whose pray and guidance showed me the right path and made the blessing of Allah shower on me.

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Zohaib Altaf

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List of Abbreviations

IOR…….…….. Indian Ocean region

IO…….. Indian Ocean

FAO…….…… United Nations Food and Agriculture Organization

UN……..... United Nations

UAE…….. United Arab Emirates

IOTC……. Indian Ocean Tuna Commission

SIOFA……....South Indian Ocean Fisheries Agreement

SWIOFA…… South Western Indian Ocean Commission

UNCLOS……United Nations Convention on Law of Sea

EZZ…….Exclusive Economic Zone

WWF…… The world Wild LIFE fund

GHI…….Global Hunger Index

EIU…….Economist Intelligence Unit

POU……Prevalence of Undernourishment

Abstract

Fisheries and seafood play an important role in food security in Indian Ocean Region. Decline of Fisheries and seafood resources due to climate change, illegal fishing, and illegal fishing practices is happening at a time when demand for fisheries resources is increasing due to increase in population and increasing Middle Class. Governance structure are present, albeit ineffective. This research aims to analyze the importance of fisheries resources in food security for IOR countries. This research also aims at understanding the nature of competition for fisheries resources among various actors. In this era of declining resources, this research uses NTS to analyze importance of fisheries and seafood for state and non-state actors and dynamics of competition. It highlights that fisheries and seafood resources are non-traditional national security challenge for many states and challenges are emerging for the coastal communities. In the views of changes happening in fisheries resources, Pakistan also need to adjust its fisheries governance according to emerging fisheries resources.

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Introduction:

The concept of food security evolved in the 20th century. It kept changing with its different dimensions. From 1940s to 1960s, the policymakers focused on the physical access of the food. During 1970s, economic dynamics were also introduced to food security. Policymakers started emphasizing on physical as well as economic access to the food. In 1980s, with physical and economic dynamics, the importance of food security at the individual level was also recognized. One decade later the importance of micronutrients was also recognized and became part of the debate.[1]

Seafood has remained a very important part of food security. The decade of 1940s was the war period and countries mostly focused on the physical access of the food resources. Since the war ended and states started focusing on re-building their relations with other states, new paradigms started emerging. Especially 1960s onwards, new trade relationships started emerging and countries also started to focus on the economic access of the food. Due to inseparable relation between strong and sustainable economy and provision of basic goods, it was evident that without sufficient economic strength, physical access to the food was also impossible.[2] First of all, food security concept talks about having physical access to the food. It is responsibility of the state to ensure that its citizens have economic and physical access to the food. It is duty of the state to protect people from hunger and provide people food security. Hunger is also a form of structural violence. It is contract between state and its citizen that it will protect them from all kind of violence. When people don't have access to sufficient amount of food because of physical or economic hurdles, it creates instability and within boundaries of state as well as competition with other states. It becomes an issue of national security. Every state tries to protect its citizens from violence which leads to competition for food security. It is duty of the state to protect main source of food and ensuring that it is in abundance and all relevant industries are getting enough products. It will lead towards sustainable economy. Seafood and fisheries also play an important role in providing food resources to the people of the IOR as part of their staple food.

[1] Maria Sassi, *Understanding Food Insecurity*, *Understanding Food Insecurity*, 1st ed. (Rome: Springer, 2018), https://doi.org/10.1007/978-3-319-70362-6.

[2] FAO, "Food Security – a History - Global Food Security," Global Food Security, 2020, https://www.foodsecurity.ac.uk/challenge/food-security-history/.

Highlighting the increase or decrease in per capita consumption of seafood (kg) in countries of IOR.

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
countries									
Australia	18.83	20.81	20.50	20.46	21.10	21.59	21.20	22.78	24.77
Bahrain									
Bangladesh	8.86	9.38	10.09	10.79	11.66	12.19	12.85	13.57	14.07
Burma	13.36	11.08	13.93	14.47	13.52	17.57	18.67	19.90	2.50
Comoros									
Djibouti	0.11	0.15	0.17	0.23	0.25	0.24	0.23	0.18	0.14
East Timor	0.00	--	---	---	4.01	4.24	4.09	4.14	4.13
Egypt	8.95	10.53	10.17	12.33	13.71	14.79	15.28	14.46	15.48
Eritrea									
India	4.20	4.51	4.58	4.56	4.68	4.47	4.82	4.69	4.76
Indonesia	17.82	18.82	19.04	19.07	19.67	20.63	21.60	21.07	20.99
Iran	5.23	5.05	5.12	4.60	4.59	4.89	4.94	5.02	6.08
Iraq	1.51	1.63	1.62	1.38	1.13	0.95	1.43	1.11	0.82
Israel	24.29	22.71	23.84	23.70	20.94	20.44	22.24	21.35	22.41
Jordan	4.63	5.13	3.95	4.59	4.08	3.96	4.50	4.81	4.81
Kenya	5.82	5.28	4.67	5.21	6.01	6.03	4.34	2.98	2.44
Kuwait	13.84	13.97	12.52	13.34	10.70	9.55	9.11	11.87	13.87
Madagascar	6.18	5.61	8.06	6.88	7.15	7.84	6.26	6.88	6.75
Malaysia	55.81	53.67	57.52	55.15	62.15	62.37	59.52	62.11	58.38
Mauritius	18.75	18.33	19.99	16.41	23.21	19.71	20.81	19.07	19.04
Mozambique	1.94	1.97	1.71	1.29	1.32	1.63	1.63	4.61	4.43
Oman	24.81	25.33	26.68	26.91	26.43	26.66	26.66	26.83	27.24
Pakistan	2.16	2.11	2.26	2.49	2.62	2.39	2.14	2.15	1.92
Qatar									
Saudi Arabia	6.83	6.17	6.57	7.06	7.14	7.06	8.013	7.61	7.82
Seychelles									
Singapore									
Somalia									
South Africa	8.59	6.62	8.17	6.62	6.53	6.14	6.97	6.99	7.09
Sri Lanka	17.91	19.60	21.45	21.76	22.50	22.34	20.38	20.24	22.29
Sudan	-	-	-	-	-	-	-	-	-
Tanzania	11.80	9.48	10.11	8.92	8.16	7.54	7.87	7.64	7.64
Thailand	31.16	31.90	29.27	29.54	30.40	29.39	29.96	30.82	33.10
UAE	23.75	23.93	23.82	26.50	25.37	26.44	25.41	26.17	27.62
Yemen	5.74	4.88	5.32	5.25	5.73	4.90	5.06	6.34	9.22

Source: FAO Table. A

It is not only a direct way of resources for the people of the IOR but also an indirect way to provide food security to the people of the region.

Historically, seafood, especially fisheries, has remained a source of conflict between countries of IOR. Pakistan and India had conflict over seafood resources, Sri Lanka and Maldives also had conflict over seafood resources. India and Bangladesh had conflict over seafood resources. The conflicts over fisheries have also remained a source of tensions between many African countries bordering the Indian Ocean. In the past, there was less gap between demand and supply. Seafood resources were in abundance. This is the reason seafood conflict did not become an important feature of countries' interaction. Now the situation has changed. Due to a number of factors like increase in the middle class resulting into increased demand for seafood resources, climate change, depleting sources, unregulated fishing in high sea, and advanced technologies have intensified the competition for seafood in the IOR

It makes seafood a concern of food and national security. Seafood provides livelihood and is an important source of protein and essential micronutrients to people in the IOR.

Food insecurity leads to other serious problems as well. Lack of nutrition leads to stunted brain growth which impacts the productivity of the population. It has an impact on the development of the whole nation. The decline in the fishing population leads to other problems as well. Food Insecurity leads to a weak immune system. The population becomes more vulnerable. In most developing nations health resources are very low. Countries of the IOR are developing nations and food insecurity in this region can have very long term consequences. Food insecurity can also lead to instability in the country. This is why food security becomes an important issue of national security.

Pakistan has an important fisheries industry too but the country has the lowest per capita consumption in the world. Pakistan can benefit from the food security competition for seafood by exporting seafood to other countries but the Pakistani seafood and fishing industry lacks modern tools and methods. Pakistan is also facing the challenge of illegal fishing and fishing of valuable tuna by Indian fishermen. Due to all these factors, important questions arise about Food security competition for seafood in the IOR. Why Food security is important and how seafood will play a role in food security competition for seafood. How it is going to play a role in the border concept of human and food security.

Problem Statement:

The seafood and fisheries resources play an important part in food security in the IOR. It provides dietary needs to 2.49 billion people of the IOR. These resources are full of macronutrients that provide protein, omega -3 fatty acids, and other vital nutrients. The Indian Ocean provided 11 million tons of seafood in 2010, which is 14.5 percent of the world's catch. Egypt, Malaysia, Mozambique, Seychelles, Singapore, Tanzania, and Thailand get more than 20 percent of their protein from seafood, and in countries like Bangladesh, Comoros, Sri Lanka, and Maldives people get more than half of their protein from seafood. According to the Global Hunger Index, in the six states of WIO's, the situation of hunger is deplorable.

With increasing demand of resources and countries dependence, the issues of governance are also becoming prominent. In the high seas, countries are using open registry vessels to exploit fishing resources. Seafood plays an important role in providing food security to people but most seafood resources in the Indian Ocean are overfished. Due to the above-mentioned challenges, competition for seafood resources is also increasing. In 2019, India and Sri Lanka had a violent clash over seafood sources in Palk bay. According to estimates of the World Bank, 14.5 million are working in the fishing industry directly in India; seafood plays an important role in providing food security in India. Sri Lankan Navy killed 8 Indian Fishermen and seized many boats. Pakistan and India also have a dispute over fishing rights. Pakistan and India's fishing dispute is on valuable tuna that is commercially valuable. Maldives and Sri Lanka have clashed over seafood resources in the IOR. Kenya, Somalia, Yemen and other countries are also competing for seafood.

To avoid conflict and over exploitation of fisheries resources, countries are taking different measures to increase sustainable use of fisheries resources. Fishing in the Bay of Bengal is decreasing that will lead to mass unemployment and migration. Last year, Bangladesh enforced a 65 days ban on fishing activities without any subsidy, which led to the protest in Bangladesh. In the same way, fishermen in different countries such as Tanzania, Myanmar, Malaysia, and Thailand are showing resistance over measures that the governments' take to increase sustainable fishing practices. Last year, 417 incidents of conflict-related fisheries happened.

Due to a decline in fish catch, people related to the fishing industry are unable to provide food to their families. They get involved in other crimes related to maritime security. Foreign fishing vessel are responsible for majority of maritime crimes happening in IOR.

All these above mentioned challenges create issues for the Pakistani fisheries industry as well. Decline of fisheries resources can become a non- traditional national security challenge. However, Pakistan has the lowest per capita consumption of seafood in the whole region fisheries resources provides primary and secondary economic opportunities. In the lieu of facts, questions arise about Food Security Competition for Seafood resources in the IOR.

Objectives of the study:

To analyze the factors which make the food resources obtained from the Indian Ocean an important element of national security in countries of the region.

To understand the (broader) dimensions of the food security competition in IOR.

To find out the implications of security competition in the region for Pakistan.

Research Questions:

How do seafood and fisheries play a role in achieving food security in IOR?

Why are the state and non-state actors competing for seafood in the IOR?

How will the competition for seafood and fisheries have implications for Pakistan?

Literature Review:

Our Literature review consists of articles and books covering food security, the importance of fisheries in food security, issues related to fisheries in IOR, the methodology used by different authors and covering articles related to non-traditional security framework.

This article was published in the Journal of Aquaculture and Fisheries. The author discussed the massive potential of the seafood industry in providing food security. Author discussed that fish production has increased in Bangladesh. It used secondary sources and used excel to analyze the data. It highlighted 270000 people depend on marine seafood for food security. Author also highlighted the legal issues which the Fishing industry in Bangladesh is facing. Author concluded that by improving methods of fishing, the fishing industry can contribute to the country's economy.[3]

The article published in the journal of Ocean and Coastal Management under the title of Unregulated and illegal fishing by foreign fishing boats in Sri Lankan waters with special reference to bottom trawling in northern Sri Lanka: A critical analysis of the Sri Lankan legislation. This

[3] Md Mostafa Shamsuzzaman et al., "The Economic Contribution of Fish and Fish Trade in Bangladesh," *Aquaculture and Fisheries* 100, no. September 2019 (2020): 1–8, https://doi.org/10.1016/j.aaf.2020.01.001.

article highlighted aspects of the competition on seafood resources in the Indian Ocean. The article showed how Indian fishermen are illegally fishing in the Sri Lankan waters. The article pointed out the illegal methods used by foreign fishing vessels in Sri Lankan waters. Author showed that foreign fishing vessels are destroying the ecosystem of Sri Lanka. The article used secondary data in its methodology.[4]

The article was published in the Journal of Indian Region. Author highlighted food security challenges faced by countries of the IOR. It also highlighted aspects of competition on seafood in the IOR. It highlighted that many countries don't have the resources to limit the illegal fishing and monitor the foreign fishing vessels. Unlike the Pacific Ocean, many agreements here are not enforced by the organizations but it depends on the will of a member country to enforce these agreements. It also highlighted that many species in the IOR are overfished. Author pointed out the Australian perspective and highlighted that Australia has limited interests in direct fishing resources but it can help countries in managing fishing resources. [5]

Shereen Sherif in his article in the journal of "International Studies" highlighted the fishing conflict between India and Sri Lanka is the legacy of colonialism. The divide between the communities was drawn by colonial powers. It is becoming the source of conflict every day. He pointed out that most scholars see this issue as an issue of the economy and food security. They neglect the role of identity in this conflict. Identity plays an important part in this conflict because on both sides of the border identity of the people is the same.[6]

ELIZABETH R. DESOMBRE in her article in International Affairs pointed out that seafood resources will have security implications. She pointed out that it was seafood resources that led to the exploration of the ocean in the first place. She mentioned the piracy problem in Somalia was the result of overfishing by foreign actors. She drew the link between the wars and fishing. She

[4] Ranil Kavindra and Asela Kularatne, "Unregulated and Illegal Fishing by Foreign Fishing Boats in Sri Lankan Waters with Special Reference to Bottom Trawling in Northern Sri Lanka : A Critical Analysis of the Sri Lankan Legislation," *Ocean and Coastal Management* 20, no. September (2019): 30, https://doi.org/10.1016/j.ocecoaman.2019.105012.

[5] Anthony Bergin, "Australia's Approach to Indian Ocean Fisheries: Towards Closer Regional Engagement," *Journal of the Indian Ocean Region* 14, no. 1 (2018): 100–113, https://doi.org/10.1080/19480881.2017.1368247.

[6] Shereen Sherif, "Negotiating Postcolonial Spaces: A Study of Indo-Sri Lankan Fishing Disputes," *International Studies* 50, no. 1–2 (2013): 145–64, https://doi.org/10.1177/0020881716654405.

highlighted that in wartime fishing vessels can be used as a tool of war, however, in the time of peace, these vessels can be used for fishing resources.[7]

ISEAS–Yusof Ishak Institute published with Fisheries exploitation in the Indian Ocean: threats and opportunities. In this book, the authors discussed many issues related to seafood resources in the IOR. In this book, the authors pointed out that seafood resources play an important role in feeding the population around the world. Fishing resources are feeding 200 million people directly. They also highlighted seafood resources in the Indian Ocean are under immense threat due to climate change and over-exploitation.[8]

In the book, Fishing: How the Sea Fed Civilization, the author argued that Fish played an important role in the growth of civilization. Fishing nutrition provided human beings with a secure source of food. Seafood is not only full of nutrition but it is also very light food. In other words, the writer highlighted the role of seafood in the food security of early human beings. He further added, to travel long distances, humans need food which is easily digestible. Seafood was a perfect source of food for such traveling.[9]

Phillip Stalley in his article pointed out the impact of climate change on natural resources. He pointed out that after the end of the cold war countries will have competition on natural resources. He explored the link between environmental variables and the prospect of international conflict. He pointed out the possibility of conflict due to human-induced pressure on resources. He highlighted three variables that can be the reason for war. These variables are fish, water, and soil. He drew a hypothesis that those countries where fish stocks are depleting are going to face conflict. He highlighted that environmental factors are not the only reason which will inclined countries towards the conflict but there is a need for control variables that are important to push countries towards the conflict.[10]

Mohammad Rubaiyat in his article, Blue Economy and Maritime Cooperation in the Bay of Bengal: Role of Bangladesh discussed different means of cooperation between different countries

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[7] Elizabeth R. Desombre, "The Security Implications of Fisheries," *International Affairs* 95, no. 5 (2019): 1019–35, https://doi.org/10.1093/ia/iiz140.

[8] Dennis Rumley, Sanjay. Chaturvedi, and Vijay. Sakhuja, *Fisheries Exploitation in the Indian Ocean : Threats and Opportunities*, 1st ed. (London: Institute of Southeast Asian Studies, 2009).

[9] Brian. Fagan and Shaun Grindell, *Fishing How the Sea Fed Civilization.*, 1st ed. (London: Yale University Press, 2017).

[10] Phillip Stalley, "ENVIRONMENTAL SCARCITY AND INTERNATIONAL CONFLICT," *Conflict Management and Peace Science* 20, no. 1 (2015): 33–58.

to achieve food security through sustainable exploitation of the resources. The Bay of Bengal is the part of the Indian Ocean which borders 5 countries and it is full of fishing resources. It mentioned the dispute between Myanmar, India, and Bangladesh over maritime boundary delimitation. Author mentioned that 30 million people are directly dependent on the oceanic economy. Author also highlighted different challenges faced by countries in the Bay of Bengal and also gave their solutions. [11]

Erika J. Techera in his published `` Journal of Indian Ocean Region" argued that attaining goals through focusing on the Blue economy should be focused on the IOR. He highlighted the challenges that are present in terms of regulating fishes. He emphasized on multiple levels of governance when it comes to dealing with issues of climate change, seafood, and food security. He also pointed out that the intersection of these problems will not have an easy solution. Countries need to address these problems on the national agenda as well as on the regional level [12]

Elizabeth R. DeSombre in her article in Global Environmental politics that many ships are using flags of convenience to get rid of regulations. It is greatly impacting fishing resources. Fishing vessels are using the open registry to avoid following the regulation. She pointed out that the trend by fishing vessels to use an open registry has increased from 10 percent in 2001 to 14 percent. These open registry fishing vessels exploit the fishing resources at the open sea. These vessels also become a risk for the biodiversity in the high sea. She also mentioned the provision of international law related to the sea which stops these open registry vessels from pursuing the straddling fish stocks or highly migratory fish stocks. She also proposed the solution to this problem. She proposed that by using the power of the market countries can force these vessels to follow rules. [13]

Ben Belton a, Imke Josepha Mariana van Asseldonk b and Shakuntala Haraksingh Thilsted in their artice in Food policy journal highlighted the lack of proper food nutrients in people of Bangladesh. Authors showed the importance of fishing resources in providing food security to people. Authors highlighted the problem with aquaculture, authors showed that despite having high per capita fish

[11] Mohammad Rubaiyat, "Blue Economy and Maritime Cooperation in the Bay of Bengal : Role of Bangladesh," *Procedia Engineering* 194 (2017): 356–61, https://doi.org/10.1016/j.proeng.2017.08.157.

[12] Erika J. Techera, "Supporting Blue Economy Agenda: Fisheries, Food Security and Climate Change in the Indian Ocean," *Journal of the Indian Ocean Region* 14, no. 1 (2018): 7–27, https://doi.org/10.1080/19480881.2017.1420579.

[13] Elizabeth R. DeSombre, "Fishing under Flags of Convenience: Using Market Power to Increase Participation in International Regulation," *Global Environmental Politics* 5, no. 4 (2005): 73–94, https://doi.org/10.1162/152638005774785507.

consumption, the nutrition level is staying low because marine capture is declining which is high in macronutrients. Authors highlighted that despite growing aquaculture food security was not achieved for the poorest consumers. Authors also showed the cost of malnutrition, which is 1 billion dollars. Authors showed an important finding that although aquaculture has increased the number of seafood and it is believed that it also helps in improving food security but it is not happening on the ground.[14]

Book Published by the USAID highlighted the importance of seafood in food security in the IOR. It highlighted that 20-30% of wild-caught seafood is used for the meal. It provides direct food to the people and contributes to food security. This book pointed out that the fish is rich in micronutrients, the fish head is full of iron, vitamin A and zinc, bone is full of calcium and flash is full of omega-3 and protein. It also highlighted that fish provides 60 percent of protein in Bangladesh, in Kenya. It highlighted fish plays an important role in reducing poverty, however, fishing resources are in great danger due to climate change. [15]

C. Peter Timmer in his book, Food Security and Scarcity argued that Food security is an individual issue, however, it becomes important at the national level because people can blame leaders for not providing an adequate food supply. He argues that increasing food prices are a key indicator of food security. He pointed out that to understand the concept of food security, distinguishing between the short term prices and long term price hike must be understood. [16]

In the book, Food Security and Global Environment Challenge, authors argued that environmental challenges pose an unprecedented threat to food security especially of those who rely on small-scale agriculture. He argued that greenhouse gas is changing the nature of the land. Due to this reason, lands will yield low productivity. He pointed out that environmental problems are not the only factor that affects food security but different macroeconomic conflicts play an important role.[17]

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[14] Ben Belton et al., "Faltering Fisheries and Ascendant Aquaculture : Implications for Food and Nutrition Security in Bangladesh Q," *JOURNAL OF FOOD POLICY* 44 (2014): 77–87, https://doi.org/10.1016/j.foodpol.2013.11.003.

[15] USAID, *Fishing for Food Security: Importance of Wild Fisheries for Food Security and Nutrition*, 2016.

[16] C. Peter Timmer, *Food Security and Scarcity: Why Ending Hunger Is so Hard*, *Food Security and Scarcity: Why Ending Hunger Is so Hard*, 1st ed. (PHI L ADELPHIA: UNI VERSI TY OF PENNSY LVANIA PRESS PHI L ADELPHIA, 2015), https://doi.org/10.1080/03066150.2016.1164518.

[17] John Ingram and Polly Ericksen, *Food Security and Global Environmental Change*, 1st ed. (Washigton, DC: Earthscan, 2010).

In the book, The Evolving Sphere of Food Security authors pointed out that millions of people suffer from hunger despite having a sufficient amount of food available to the world. He pointed out the dynamic of competition in food security. He highlighted that the policies to provide food security in one country can also impact other countries, and its food security situation. Countries are interlinked with each other on food security issues.[18]

We read many articles and books which discussed the importance of seafood resources. One article discussed the food security situation in Bangladesh, then one article discussed maritime cooperation in the Bay of Bengal for achieving food security, the article also discussed the encroachment of foreign fishing vessels in Sri Lankan waters. Another important article highlighted, despite increasing per capita consumption of fish in Bangladesh, food security was not achieved. It decreased. One article also discussed the Australian perspective and highlighted the lack of mechanism among member states to regulate illegal fishing. One article discussed the need for multiple levels of governance when dealing with the intersection of issues. In one article the author discussed the dynamics of climate change and in one book the impact of climate change was discussed on food security. In one article security implications of seafood were discussed and another article discussed the exploitation of seafood resources by open registry vessels. One book discussed the importance of seafood resources in human civilization. In another book, the author discussed the exploitation of seafood resources and threats because of it.

All authors made excellent efforts to highlight the different aspects of the issue of food security. The first thing which was missing in all articles and books was the lack of literature from the perspective of International Relations. I didn't find a single article that addresses the issue of seafood and conflict from the perspective of International relations.

Secondly, most of these articles and books discussed food security as an individual issue, C.Peter Timmer made a very important point when he called it a national issue because national leaders face pressure because of food insecurity in the population. He didn't address the contribution of seafood in food security and how countries are competing on fishing resources specifically in the IOR. In the book, The Evolving Sphere of Food Security author highlighted the impact of decision making related to food security in one country has an impact in another country but it didn't specifically highlight how decision making on seafood impacts food security in another country.

[18] Rosamond Naylor, *The Evolving Sphere of Food Security*, ed. Rosamond L. Naylor, 1st ed. (London: Oxford University Press, 2017).

The third thing which lacked in the literature was any comprehensive book or article which would address the different variables collectively to draw the fact-based conclusion and explain the dynamics of food security competition for seafood in the IOR. All variables are connected when we talk about food security competition on fishing resources in the IOR. The research gap was also present related to the importance of food security in national security.

The last thing which was missing in the literature was the perspective of Pakistan. Pakistan is an important state of the IOR. Pakistan has a population of more than 200 million people and a coastline of more than 1200 nm. Lots of Pakistani population depends on fishing resources although per capita fishing consumption in Pakistan is the lowest in the region. Pakistan also has a conflict with India over maritime border delimitation. Many Indian fishermen encroach on the Pakistani side every year. Having the perspective of Pakistan is important in this regard.

Major Argument:

Food Security will become a concern of national security, and as an important component of food security for different non-state actors, it will lead states and non- state actors towards competition for seafood resources. It will create challenges for Pakistan, however, due to less per capita consumption. Pakistan can cooperate and benefit from competition.

Theoretical Framework:

Undertaken research uses the Non-Traditional Security Framework. At the broadest level NTS is about to shift away from the traditional state centric and military focus paradigm of traditional security. The evolution of NTS owes to postcolonial approach and security thinking from the third world. Mely Caballero-Anthony and Alistair D.B. Cook gave the NTS Framework in their book "In *Non-Traditional Security in Asia: Issues, Challenges and Framework for Action".*

Non- Traditional Security Framework carries on the basic idea of the securitization theory and acknowledges that security is just not limited to the domain of traditional security. After the Cold War the security environment has changed. Now, new non-traditional security threats are emerging as well. The traditional Framework of security kept the state at the center. The traditional security approach focused on the state and its survival in the anarchical world. It ignored other drivers of the disorder which are not caused by the interstate war but were the result of people's identities, histories, and resources. Non-Traditional Security issues are those issues which affect the survival

and well-being of the people which primarily arise from non- military sources, such as climate change, resource scarcity, infectious diseases, natural disasters, irregular migration, and famine.[19] Non-Traditional Security threats share space with both human security and comprehensive security. Non-Traditional Security Threats may be non-military but Non-Traditional Security Framework recognizes that they could lead to conflict or even war. It shows that the NTS Framework talks about resolving issues through transnational corporations but it doesn't negate the possibility of competition, conflict, or even war among states. [20]

NTS Framework recognizes both individual and state both as the object of security. Traditionalists conceptualize the security in terms of sovereignty which is insufficient because the nature of challenges in the Modern era is very different. Human Security approach gives importance to challenges of economic security, health security, environment security, the security of the community, and people. Human Security puts people, not the state at the center. NTS Framework bridges the gap between the two approaches. [21]

NTS Framework also addresses the issue of food security. The human security approach holistically understands food security. Food security is achieved when all the people, all the time, have physical, social, and economic access to safe and nutritious food, which meet their dietary needs. It addresses food Security as a comprehensive approach that also realizes the importance of health and the environment. It also addresses the issue of malnutrition. Food security has many repercussions for human security like survival. Food insecurity can hurt the state as well, because it reduces the productivity of the population and due to weak immune systems they can also become a burden on the health system.[22] Food insecurity can also impact social and political stability. It can challenge the legitimacy of the regime so it becomes a national security issue. Food security can also become a challenge for regional security, because food security policies in one country can harm other countries. [23]

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[19] Caballero-Anthony and Cook, "NTS Framework."

[20] Caballero-Anthony and Cook.

[21] Mely Caballero-Anthony, "Understanding Non-Traditional Security," in *An Introduction to Non-Traditional Security Studies: A Transnational Approach*, ed. Mely Caballero-Anthony, 1st ed. (Lond: SAGE Publications Ltd, 2018), 3–19, https://doi.org/10.4135/9781473972308.n1.

[22] Irene A Kuntjoro, Sofiah Jamil, and Arpita Mathur, "Food," in *Non-Traditional Security in Asia: Issues, Challenges and Framework for Action*, ed. Mely Caballero-Anthony and Alistair D.B. Cook, 1st ed. (Singapore: Institue of SouthEast Asian Studies, 2013), 40–55, https://doi.org/10.1080/19480881.2017.1368250.

[23] Kuntjoro, Jamil, and Mathur.

NTS assumes that non-traditional security threats or challenges to traditional security can't be eliminated without a multilateral corporation, because the national level is not sufficient, and NTS considers regional level is more sufficient. The pursuit of optimization in the decision-making process is the rationale behind this approach. Any single state capacities are not enough to deal with the non-traditional security challenges, so they decide to work on the multilateral level to reduce or eliminate the security threat.

The Problem of state decision making has been discussed before in International relations. Cox Jacobson argued that states are ready to give part of their problem to a higher level if the problem they are facing is of technical nature, was not politicized, and didn't touch their national interest.[24] National Interest is the state that seeks to protect or achieve concerning others.[25] When it comes to security, it is very unlikely that states will adopt regional one rather than national one.

Regional governance is another important influence that allows the state to cooperate. We can define the region as a "supranational unit of governance that is not state but has some statehood properties" and we will define the governance "as a specific form of international level of decision making in opposition to the almost exclusive role of the nation-state.[26] Thus we will define regional governance as a "multi-dimensional set of an institution which can answer regional challenges, where regional level represents arrangements between individual nation-states is not dominated by a regional institution and involve a combination policy mechanism located at regional and state level.[27]

There are some regional governance institutions in the IOR but there is not even a single institution where all states are represented. Secondly, regional governance institutions cannot solve the challenges in the IOR. This is why states will most like to compete while cooperating on the issues where they are not linked with their national security issue.

[24] Robert W. Cox, *The Anatomy of Influence: Decision Making in International Organizations*, 1st ed. (London: Yale University Press, 1973), https://doi.org/10.1017/s0022278x00053349.

[25] Farah Naaz, "Role of National Interest," in *International Politics: Concepts, Theories and Issues*, ed. Rumki Basu (Bombay: SAGE Publications Inc., 2012), 52–70, https://doi.org/10.4135/9788132113997.n2.

[26] Luk van Langenhove, "Why We Need to 'Unpack' Regions to Compare Them More Effectively," *International Spectator* 47, no. 1 (2012): 16–29, https://doi.org/10.1080/03932729.2012.655005.

[27] Katarzyna Marzęda-Młynarska, "Food Security Governance in Southeast Asia Region: From National to Regional Governance," *History and Politics* 20, no. 27 (2017): 31–48.

Research Methodology:

Undertaken uses a combination of qualitative and quantitative methodologies. Undertaken will use the official documents which are released by the countries of the IOR. Undertaken research uses be descriptive and explanatory tools to describe and analyze data related to food security competition for seafood in the IOR. Undertaken research uses the words to describe the dynamics of Food security competition for seafood and explanatory tools to enhance our understanding of food security competition.

Many countries publish their maritime and blue economy policies. IOR consists of more than 45 states. Undertaken will focus on their documents related to food security and seafood. Undertaken research uses countries' official documents and reports about the state of food security. Undertaken research uses documents of different maritime agencies of the IOR. Undertaken research describes and analyzes press releases by food security ministries, maritime time ministries, and other relevant departments of countries of IOR countries. Undertaken research study the official documents related to food security and seafood disputes. Undertaken research studies different countries' narratives on maritime border delimitations and their claims for the continental shelf. Undertaken research uses the newspapers and news media of IOR countries and look for news related to seafood and food security.

Undertaken research studies International newspapers as well. Undertaken research objectively analyze these stories to remove any bias from their news stories to bring objectivity. Undertaken research also compare it to the coverage of international news organizations to get a more balanced view. Undertaken research also use different research journals. Undertaken research also uses magazines like The Economist, Foreign policy, Foreign Affairs, The Atlantic, The Newsweek, and other news magazines. Undertaken research mostly focuses on their Asia edition. Undertaken also use magazines especially focused on food security, environment, aquaculture, and seafood. Undertaken research also analyzes the newsmagazine articles to remove any factual or subjectivity. Undertaken research studies international relations journals like International Security, International Affairs, International Relations, International Organization, World Politics, and European Journal of International relations, International relations of Asia pacific, Security Studies, and other journals covering international relations. Undertaken research uses also focus on the journals of the Indian Ocean Region like the journal of the Indian Ocean Region. Undertaken research uses journals covering food security like Global Food Security, journal of

food security and Nutrition, Food Security, Agriculture, and Food Security, and other journals covering the topic of food security. Undertaken research also uses the journal working related to environmental studies. Undertaken research will also use other research journals which will have the relevant material.

Undertaken research also uses websites related to food security, seafood, aquaculture, and covering news related to food security, environmental degradation, overfishing, and anything relevant related to our topic. Undertaken research uses online databases like science direct, Microsoft Academia, Base, Google scholars, and other online searching material for the relevant material.

Undertaken research also uses the data from international organizations like United Nations World Food Program, United Nation Food and Agriculture Organization, World Bank, Environmental Protection Agency, and other organizations working on Food Security, Seafood, and Environmental degradation. Undertaken research uses the material of other regional organizations working on Food Security and Seafood. Undertaken research uses the data from regional organizations working on food security, seafood, and the environment. Undertaken research uses the data from think tanks of different countries working on maritime security, seafood, and food security. Undertaken research also uses the data of international think tanks.

Undertaken research conduct unstructured interviews from seafood, food security, and maritime security experts in Pakistan. For quantitative data, Undertaken research uses Microsoft Excel to analyze the data and in our qualitative research,

Significance of the Study:

Most studies on food security were conducted from the perspective of social issues and were more focused on agriculture than fishing resources. In this study, undertaken research takes food security from the perspective of seafood and as a national security issue among different actors in the IOR. Undertaken research studies the competition for seafood resources in the depleting seafood resources in the IOR due to climate change, overfishing, and unregulated fishing resources in the IOR. Undertaken research also sees disputes between India and Sri Lanka, Pakistan and India, Sri Lanka and Maldives, Somalia, Yemen, Kenya, and other non-state actors. Undertaken research also studies the depletion of commercially important seafood in the Bay of Bengal.

Undertaken research also sees this food security competition from the perspective of International Relations. Food security is very rarely seen from the perspective of International Relations, undertaken research focuses on different dynamics among states in the IOR. Undertaken research

sees how the food security policy of one country has an impact in another country and how this leads to competition among countries in the IOR. Undertaken research studies the impacts of the country's food security policies on each other in the domain of International Relations.

Undertaken research uses securitization theory and the Non-traditional security framework to analyze the food security competition for seafood in the IOR. Undertaken research also use a combination of quantitative and qualitative methodologies together.

Undertaken research also studies from the perspective of Pakistan, Pakistan is an important country in the IOR. Pakistan has a coastline of more than 1250 nm and with a vast exclusive economic zone and continental shelf. Pakistan has the lowest per capita seafood consumption in the region. Undertaken research sees how Pakistan can improve its fishing industry to get the maximum benefit from competition for the fishing resources in the IOR. Undertaken research sees the challenges Pakistan can face due to the competition in the IOR. The purpose of this research is academic; however; it has a scope of applicability.

Delimitation:

Undertaken research do not study the cultural and identity factors. Undertaken focuses on food security competition seafood. Undertaken research analyzes facts from the perspective of food security competition on fisheries and seafood. Undertaken research just focuses on the IOR. Undertaken research don't analyze the policy of all regional countries.

Organizational Structure:

Following the Introduction, chapter one discusses historical evolution of food security concept and link with International relations and securitization of food security concept, historical importance of fisheries, fisheries governance institution, and competition for fisheries resources. Chapter 2 discusses the way fisheries and seafood are part of food security in IOR. Furthermore, it discusses fisheries role in food security from four perspectives. Chapter 3 discusses the reasons of competition for fisheries, governance structure, problems with governance structure, competition between states for fisheries resources, and different dynamics of fisheries conflicts. Chapter 4 discusses implications for Pakistan, and then it gives findings, recommendations and conclusion.

Key Terms: Food Security:

"Food Security means that all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life".

Chapter 1: Historical Background of Food Security Concept, Role of Fisheries, Competition and Governance Mechanism

Food is the basic necessity of human beings. To have a healthy population food plays a vital role. Food security is a concept that has been in development from many decades. First, food security was just limited to physical access of people to food, then the economic side got importance. With research and collaboration with other institution, nutritional side of food security got importance too. Fisheries and seafood play an important role in food security especially by providing nutrition. With growing importance of fisheries challenges and competition related to fisheries and seafood resources started emerging as well. To overcome these challenge, the governments of the world established different institutions of governance in the IOR. Pakistan is also a part of the IOR. Fisheries and seafood did not remain a favorite food in Pakistan; however, Pakistan had a study production of fisheries and seafood.

In this chapter undertaken research discusses (i) evolution of food security concept, (ii). Importance of fisheries and seafood in food security (iii). Governance mechanism for fisheries resources, (iv) incidents of competition for fisheries resources, and (v) historical overview of fisheries resources in Pakistan.

1.1 Evolution of Food Security Concept and International Relation

Food Security is a flexible concept. It has many definitions and interpretations. According to Maxwell, Food Security has around two hundred definitions. It is hard to describe all these concepts and their evolution, which is behind the scope of this work. Undertaken research focuses on the food security concept given by the United Nations Food and Agriculture Organization. The World Food summit approved the definition in1996, and the term social was added into it in 2002. Food security remained a vital concept in the 20th century.

Initially, the idea of food security focused on physical access to food, and states were also focusing on physical access to food.[28] Moreover, in 1940s, countries were focused on physical access to food, because of the Second World War. It was important for states to have enough food during war to maintain domestic stability. During this decade, physical access to food was the main concern of states. Even in the speeches of world leaders concerns related to physical access to food were visible.

[28] FAO, "Food Security – a History - Global Food Security."

US President Roosevelt during his State of Union address highlighted the four fundamental freedoms□— freedom of speech, freedom of worship, freedom of want, and freedom from fear. Physical access to food was vital in achieving the goal of freedom from need; moreover, he highlighted another significant aspect during his address, "The one supreme objective for the future, which we discussed for each Nation individually, and for all the United Nations, can be summed up in one word: Security. And that means not only physical security, which provides safety from attacks by aggressors. It also means economic security, social security, moral security in a family of Nations." [29] He further added that freedom from fear has a connection with freedom from want. [30] His speech highlighted that a state could never be truly free from fear until it has physical access to resources.

Food security was a fundamental concern of the countries during this decade. The US President categorized it as the primary duty of governments to ensure access to food. In addition, he expanded the definition of security and said that physical security as well as other aspects of security is vital. It shows that he considered it the responsibility of the state to provide comprehensive security to people. Like territorial security, other features of security are equally foremost for the protection of states, including food security. In addition, countries started taking measures to achieve comprehensive security.

To gain freedom from fear through achieving the goal of freedom from want, the US president took the initiative of the United Nations Conference on Food and Agriculture. The purpose of this founding conference was to ensure the goal of freedom from want concerning food and agriculture. This conference acknowledged the fundamental importance of human access to food.[31] The main element here is that states acknowledged food security as their responsibility. In 1941, states were combining the features of human security and traditional security. Furthermore, the conference on Food and Agriculture during World War II showed that countries were giving equal importance to Non-Traditional Security threats, especially related to food security. The importance of food security in the overall security was visible from actions of the participants of the above mentioned conference.

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[29] Franklin D. Roosevelt, "State of the Union Message to Congress," Franklin D. Roosevelt Presidential Library and Museum, 1941, http://www.fdrlibrary.marist.edu/archives/address_text.html.

[30] Roosevelt.

[31] D John Shaw, *World Food Security: A History since 1945*, ed. PALGRAVE MACMILLAN, 1st ed. (London: PALGRAVE MACMILLAN, 2007), https://doi.org/10.1080/02255189.2009.9669233.

Representatives from 44 states participated in the conference and signed the final act. It also adopted recommendations on improving the national diet; diet of vulnerable groups; malnutrition and disease; deficiency diseases, and many other suggestions. This conference linked matters of food security with International Security. [32] The most important lesson which undertaken research draws from the first conference on food security is that food security was a global concern and not just a matter confined inside borders but a vital matter of International affairs. Although undertaken research doesn't deny its importance within the boundary of a state, its international dimension is also vital to ensure food security in the world. With Physical access, other aspects of food security were also getting importance.

This conference acknowledged the importance of the economic aspect of food. It also highlighted that the most important cause of malnutrition around the globe is poverty. Without financial access to food, achieving the goal of freedom from fear by attaining the aim of freedom of want is impossible. It gave importance to the economic betterment of people. In the first declaration of the Food and Agriculture, countries acknowledged the importance of the economic aspect of food security; nevertheless, countries mostly kept focusing on the physical access of food, because it was the war period. Besides acknowledging the importance of the state's traditional security, the states accepted the human security aspect of security as well, which states acknowledged in the first food and agriculture conference.

This conference also pointed out the importance of collective action of countries; furthermore, it underlined that no state could attain this goal without the help of the international community and emphasized on the cooperation among state to achieve food security. [33] Besides, the last clause emphasized on the importance of cooperation among states. Consequently, it is very vital for countries to come together to provide food security to their people and also signifies the historical significance of food security in international relations. In addition, this conference made it a matter of state security that deals with International Relations. Countries formed an international institution to understand different dynamics of food security.

After the establishment of FOA, it conducted its first survey in 1946. The objective of this survey was to know about the condition of the food supply; moreover, the aim of this survey was to get

[32] United Nations Food and Agriculture Organization, "FAO: Its Origins, Formation and Evolution 1945-1981," FAO Website, 1943, http://www.fao.org/3/p4228e/P4228E04.htm.

[33] John Shaw, *World Food Security: A History since 1945*.

information about calories and micronutrients available to the population in the world. The conclusion of the first survey was astonishing. It concluded that one-third of the world population was not getting a sufficient amount of food and calories. Furthermore, countries were inviting FAO to get help developing the fisheries sector that help them eradicating malnutrition.

In 1946, the Greek government requested FAO for a commission that could help the country with the development of agriculture and fisheries. [34] It showed the significance of food security for states and the importance of fisheries in food security. FAO was conducting the research and planning in 1946, and all these developments were helping the world governments and FAO in enhancing their understanding of food security. Furthermore, it helped and led to the creation of a comprehensive definition of the Food Security definition. In order to develop more comprehensive definition different advisory committees were formed.

In the same year, special advisory committees were formed, and provision was added within the framework FAO to perform the specific duties. These committees were researching specific matters such as nutrition, economics, statistics, forestry, fisheries, and other important matters.

All these committees contributed to the evolution of the food security concept. After knowing about the situation of nutrition in the world population, FAO was equipped in a better way to understand the food security concept, and it helped in the evolution of the definition of food security. In addition, it also helped countries in enhancing their understanding of food security. In the initial days, countries were just focused on the supply side of the food, then countries also accommodated the economic side of food security, which was even visible in the initial days of the FAO framework when it acknowledged that without eradicating poverty, you could never eliminate hunger from the world. The developments on food security front kept happening. [35]

Significant developments happened from 1945 to 1970. FAO and World Health Organization passed resolutions respectively in 1961 and 1963 to formulate Codex Alimentarius Commission. Both organizations also adopted rules and procedures. The main objective of this commission was: "the Codex Alimentarius Commission shall... be responsible for making proposals to, and shall be consulted by, the Directors-General of the Food and Agriculture Organization (FAO) and the

[34] I N O Additional, The Food, and The United Nations, "The Food and Agriculture Organization of the United Nations," *International Organization* 1, no. 1 (1947): 121–23, https://doi.org/10.1017/S0020818300006688.
[35] FAO and WHO, "Codex Alimentarius - Joint FAO/WHO Food Standards Programme," *World Health Organization Food and Agriculture Organization of the United Nations*, vol. 21 (Rome, 2013), www.codexalimentarius.org.

World Health Organization (WHO) on all matters of the implementation of the Joint FAO/WHO Food Standards Programme"[36]. Besides, this commission was also responsible for taking actions to improve the standard of the food and ensuring fair practice in the food trade. It was another significant step in the evolution of the food security concept.[37]

Different organizations were coming together to address different dynamics of food security problems. This commission was giving importance to the safety of the food. All these steps contributed immensely to the evolution of the food security concept. It points out that an international effort was going on to address the dynamics of food security. Its membership was open to all countries that were ready to take its steps. The developments on food security kept happening.

Countries signed the first wheat agreement in 1949. Three times in 1953, 1956, and 1959 it was renewed, and it expired in 1962. In 1962 wheat agreement was recommenced again. This trade agreement aimed to ensure that those countries that rely on wheat and wheat flour import have a sufficient amount of food available to them; furthermore, it was also necessary for removing hurdles in exporting and import of wheat and focused on increasing the consumption of wheat and wheat flour. It highlighted the importance of international cooperation in stabilizing wheat demand and supply. In addition, a committee was formed to control prices. Additionally, in this agreement balance of commitment and balance of entitlement were included. [38]

The first agreement on wheat was signed in 1949; however,[39] in 1996, countries signed the first agreement on agriculture within the framework of the WTO framework. It was part of the Marrakesh Agreement.[40] It was a significant development when it comes to the evolution of the food security concept. As a result, a rule-based trade was starting between countries. It helped in improving the economic aspect of food security, since countries were trading and physical access to food was not a big issue. People needed economic access to food to eliminate food insecurity.

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[36] United Nations Food and Agriculture Organization, "Understanding the Joint FAO/WHO Codex Alimentarius Commission," FAO Website, 1961, http://www.fao.org/3/y8705e/y8705e0a.htm.

[37] FAO and WHO, "Codex Alimentarius - Joint FAO/WHO Food Standards Programme."

[38] United Nations, "International Wheat Agreement, 1962, as Adopted at the Final Plenary Session.," hathitrust.org ([New York, 1962), http://hdl.handle.net/2027/coo.31924013924141.

[39] Helen C . Farnsworth, "International Wheat Agreements and Problems , 1949- 56," *The Quarterly Journal of Economics* 70, no. 2 (2014): 217–48.

[40] WTO, "The WTO Agreement Series" (Geneva: United Nations, 1998), https://www.wto.org/english/res_e/booksp_e/agrmntseries1_wto_e.pdf.

Without having stable prices and sufficient economic power, governments can never really address the challenge of food security.

In 1963, the Kennedy Round of Negotiation on the tariff of international trade under the General Agreement on Tariffs and Trade (GATT) recognized the importance of agriculture; in addition, [41]the year 1974 was very significant in the evolution of the food security concept, and before this conference, countries were facing the immense problem of food insecurity. The United Nations World Food Conference took place in 1974. The main objective of this conference was that nobody within the coming decade suffer because of a lack of food or food insecurity. These recommendations were dealing with what we know as "Food Security". The conference acknowledged food security is an issue of all nations, and international effort is required to resolve the matter of food security. Before the 1974 conference, the world was facing a food shortage crisis, and OPEC also increased oil prices. The demand for food was growing at the same time, and the supply of food was decreasing.[42] It was the responsibility of the state to provide people with a sufficient amount of food, and they wanted to make sure that people have adequate access to food products, because physical access to food was becoming a challenge because of the food shortage.

In this conference, food security was defined as the availability of food all the time. There was less focus on economic and nutritional security in the definition, because the meeting was happening when there was less grain production. Even the USSR was importing grains from the US,[43]and in 1974, the US food exports were 66 percent higher than 1973, as a result, it was reducing food storage. The world food stock was also decreasing rapidly; furthermore, in 1974, 100 million tonnes of food was left in stock that was 200 million tons in 1970. With reducing food stock, the world oil crisis was also increasing concerns related to food security.[44]

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[41] Lucia Coppolaro, "US Policy on European Integration during the GATT Kennedy Round Negotiations (1963-67): The Last Hurrah of America's Europeanists," *International History Review* 33, no. 3 (2011): 409–29, https://doi.org/10.1080/07075332.2011.595170.

[42] Corinne A. Pernet and Amalia Ribi Forclaz, "Revisiting the Food and Agriculture Organization (FAO): International Histories of Agriculture, Nutrition, and Development," *International History Review* 41, no. 2 (2019): 345–50, https://doi.org/10.1080/07075332.2018.1460386.

[43] Food and Agriculture Organization, "Coming to Terms with Terminology: Food Security, Nutrition Security, Food Security and Nutrition & Food and Nutrition Security," *Committee on World Food Security* 39, no. 4 (2012): 1–14, http://www.fao.org/docrep/meeting/026/MD776E.pdf.

[44] Food and Agriculture Organization.

It was the reason countries in 1974 remained focused on physical access to food, and the physical access to food was vital, because it could cause instability within a state. It is the responsibility of the government to provide people with food. If a government can't supply food to its people, it will weaken the social contract between the state and people. In addition, it can challenge the legitimacy of the government, if it doesn't have the ability to provide food to the table. Due to all these reasons, the conference of 1974 remained focused on physical access. The term food security came out of the 1974 conference.[45] It was a significant development in the evolution of the concept of food security, although many components of food security were missing from it.

After 1974, the most vital year in the evolution of food security was 1996. From 13 November to 17 November, the World Food Summit started in Rome. Representatives of 185 countries participated in this conference, and in this conference, the food security concept was defined in three dimensions. These three vital dimensions of food security were: physical, economic, and nutritional food. They adopted the definition of food security in this summit. [46]

"**Food security** exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious **food** that meets their dietary needs and **food** preferences for an active and. healthy life" [47]

In this summit, the focus of food security was just not defined in terms of physical access to food, but also the economic and nutritional aspects of food. In 2002, the term social was included in the definition.

1.2 Historical Importance of Fisheries in Food Security in India Ocean Region:

Fisheries played a vital role in providing food security in many countries of the Indian Ocean region; fisheries also play a significant role in providing nutritional security to the people of the IOR. Furthermore, fish and seafood provide food security provides dietary needs to 2.49 billion

[45] Food and Agriculture Organization.

[46] John Shaw, *World Food Security: A History since 1945*.

[47] United Nations, "World Food Summit - Final Report - Part 1," *FAO Website* (Rome, 1996), http://www.fao.org/3/w3548e/w3548e00.htm.

people of the IOR.[48] Food security has many vital components such production and nutritional contribution of a product.

As for as the production is concern, the Indian Ocean provided 11 million tons of seafood in 2010, which is 14.5 percent of the world's catch. Fisheries and seafood plays an important role in providing nutritional security as well. Egypt, Malaysia, Mozambique, Seychelles, Singapore, Tanzania, and Thailand get more than 20 percent of their protein from seafood, and in countries like Bangladesh, Comoros, Sri Lanka, and the Maldives, people get more than half of their protein from seafood. Fisheries and seafood also contribute to food security in indirect manner.

In 2010, IOR countries like Bangladesh, Indonesia, Thailand, Egypt, and Myanmar were among the world's top ten producers in the world. Seafood plays a vital role in providing food security to people. The export of fisheries resources plays a vital role in providing food security, as they provide vital source of food security. However, due to unsustainable use of fisheries resources is creating challenges as well.

Fisheries and seafood resources in the Indian Ocean are facing the threat of overfishing.[49] Fisheries and seafood resources are also facing many challenges due to increase in population, middle class growth, pollution and climate change. Historically, the contribution of these factors was not significant. However, these factors are play a prominent role in declining fishing resources in Indian Ocean region. Therefore, competition for fisheries resources has become a possibility. The Indian Ocean region consists of 37 states. In this part, the undertaken research will see historical patterns of fish and seafood consumption in the countries of IOR. Undertaken research not only discusses the historical patterns of consumption, but it also analyze the contribution of fisheries as a secondary source of food.

It contributes to food security in two ways. In one way, it is a direct source of food and many essential nutrients for people. It is also a source of income for many people. Millions of people in IOR are associated with the Fisheries and seafood industry.[50] In this section of undertaken research, undertaken research shows the per capita consumption of fish and seafood from 1990-

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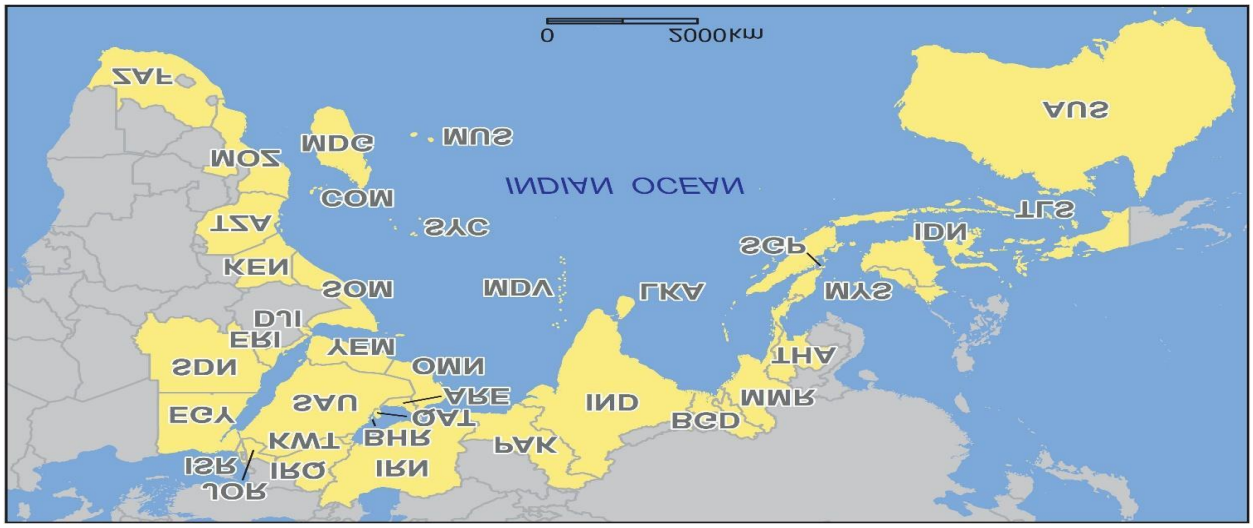
[48] Rupert Herbert-Burns, *Indian Ocean Rising: Maritime Security and Policy Challenges*, ed. David Michel and Russell Sticklor, *Jstor*, 1st ed. (Washington, DC: Stimson, 2012), https://www.jstor.org/stable/resrep10840?seq=2#metadata_info_tab_contents.

[49] Herbert-Burns.

[50] FAO, "Contribution of Fisheries to Food Security," *Fisheries AndAquaculture Department, Food and Agriculture Organization of the United Nations*, 2016, http://www.fao.org/fishery/topic/12367/en.

2010. Undertaken research discusses the 20 years of data on fish and seafood consumption, because change in fish and seafood consumption highlights fisheries and seafood role in food security. Studying 20 years of data enables us to analyze it in a better way. Undertaken research discusses employment in fisheries and the seafood industry. Discussing per capita consumption of seafood and fisheries and employment in the fisheries and seafood industry helps in knowing the historical importance of Fisheries and seafood in food security in IOR.

Map of Indian Ocean Region countries



Source: Indian Ocean Commission *map. 1 Indian Ocean region*

1.3 Historical Dependence of the Indian Ocean Countries on Fisheries and seafood resources:

The contribution of Indian Ocean in food security remained palpable. Countries of IOR depend on fisheries and seafood resources. Nevertheless, all countries don't depend on fisheries and seafood resources in the same way. Therefore, undertaken research uses the World Wild Life Fund's fisheries dependence index to categorize countries of IOR into different groups.

This categorization of countries based on the World Life Program report that categorizes countries' dependence on fisheries and seafood resources; in addition, the report classifies countries in the following categories: High dependence, Medium High, Medium, and low. The report uses different variables such as fish as source of food and income; food insecurity among population; gross domestic product, and per capita consumption to determine the category of a country. The undertaken research uses the categories developed by the WWF and collects the data of per capita consumption of countries from 1991-2009. Furthermore, this data was obtained to get the historical

perspective of fisheries and seafood consumption. Besides this data, the data of employment in fisheries and seafood industries was used to describe the countries' dependence on fisheries and seafood. [51]

The countries of the Indian Ocean are part of the above mentioned categories. In the first category, the countries that heavily rely on fisheries and seafood are placed. In the first category of high dependence following countries lie: Sri Lanka, Bangladesh, Maldives, Myanmar, Thailand, Malaysia, Indonesia, Egypt, Mauritius, and Seychelles. The second category consist of 6 countries, and those countries are, Madagascar, Mozambique, Tanzania, Somalia, Comoros, and Sudan; furthermore, in the third category of medium dependence, these countries are included: Pakistan, India, Australia, Oman, Israel, South Sudan, Kenya, Djibouti, and Yemen, and in the last categories of low dependence Saudi Arabia, UAE, Kuwait, Singapore, Qatar, Bahrain, and Iraq are included.[52]

1.3.1 Per capita consumption in High Dependence countries:

Sri Lanka is an Island nation, because of this, its reliance on fisheries and seafood for food security is natural. According to the World Food and Agriculture Organization, historically, the fisheries sector played an important role in providing food security to the people of Sri Lanka. It also played a significant role in providing nutritional security to people, which is a vital component of Food Security. It contributed 2 percent of Sri Lankan GDP in 2004; besides, in 2004, the primary and secondary fisheries and seafood sectors employed 250000 and 10000 respectively.[53] Undertaken research shows per capita fish consumption, because it shows the importance of fisheries as a source of food in Sri Lanka. Undertaken research takes the per capita fisheries data from 1991 to 2009. Fisheries and seafood contributed in providing food security to the people of Sri Lanka and remained an important part of food security; moreover, it is an indirect way of providing food security to people.[54] After Sri Lanka, Bangladesh also heavily relies on fisheries and seafood for food security.

From 1991 to 2009, the Per capita fish and seafood consumption had been rising in Bangladesh. Fish and seafood per capita consumption had raised 12 kg from 1990 to 2010. It highlights the

[51] Martin Quaas et al., "Fishing for Proteins," *Wwf Germany* (Hamburg, 2016).
[52] Quaas et al.
[53] FAO, "FAO Fishery Country Profile - Sri Lanka" (Rome: United Nations Food and Agriculture Organization, 2006), http://www.fao.org/fi/oldsite/FCP/en/LKA/profile.htm.
[54] FAO.

value of fish and seafood as a vital source of food security in Bangladesh. It shows the significance of the fisheries as the direct source of food security. The Fishing industry contributed 4-6 percent to its GDP, and Seafood's contribution to agriculture had been increasing from 7 percent in 1973-75 to 15 percent in 1993 to 1995. The fishing sector's contribution saw a significant rise; in addition, it shows that the Fishing Industry remained a vital component of food security in Bangladesh. From 1990 to 2010, the fish consumption had been increasing 7 percent.

Another country in the Indian Ocean region that relies on seafood is Maldives. In the Maldives, seafood plays a vital part in Food security, as it is an island nation. In 1996, the fishing industry had provided jobs to 2000 and 50000 people in the primary and secondary sectors, and currently, the fishing industry accounted for 11 percent of the Maldives' GDP. It contributes74 percent to the country's exports. The per capita consumption of fisheries remained high in Maldives.

There was a 100 kg increase in per capita consumption of fish and seafood in the Maldives in 20 years. It highlights the importance of fisheries and seafood in providing food security to the people of Maldives.[55]

Myanmar is another country where seafood plays a vital role in food security. In 2003, 797,738 and 256, 2230 people were working in the primary and secondary sectors respectively. In the historical perspective, it highlights the significance of the fish and seafood sectors in providing food security to the people of Myanmar. It remained not only a source of food and protein but also a vital source of income.[56] In 1990, the per capita fish consumption was 15.5 kg, and in 2010, it had reached 50 kg. It witnessed an increase of 35 KG in the last 20 years. It is a very high rate of fish consumption. Therefore, in Myanmar, the fishing industry provided food security to people in the direct and indirect way.

Fisheries and seafood played a vital role in food security in Thailand. In 2000, it had contributed 123.2 billion baht to the GDP of Thailand. Out of the total GDP, the contribution of fish and seafood was 2.5 percent in the overall GDP, and 30 percent in the agricultural GDP.[57] In 1990, per capita of fish and seafood consumption in Thailand was 19 KG, and it had reached 24 KG in 2010.

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[55] FAO, "FAO Fishery Country Profile - THE REPUBLIC OF MALDIVES" (Rome: United Nations Food and Agriculture Organization, 1998), http://www.fao.org/fi/oldsite/FCP/en/MDV/profile.htm.

[56] FAO, "FAO Fishery Country Profile - THE UNION OF MYANMAR" (Rome: United Nations Food and Agriculture Organization, 2006), http://www.fao.org/fi/oldsite/fcp/en/mmr/profile.htm.

[57] FAO, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Kingdom of Thailand" (Rom: United Nations Food and Agriculture Organization, 2000), http://www.fao.org/fishery/facp/tha/en.

There was a 6 kg increase in per capita consumption of fish and seafood. It remained a few Kg higher than the average per capita consumption of the world. It highlights the importance of fish and seafood in providing food security to the people of Thailand.

In Egypt, 65000 to 300000 people had been working in the primary and secondary sectors in 2001. It means that fisheries and seafood played a vital role in providing food security to thousands of people. [58]Table 1.1 shows the historical trends of fisheries and seafood consumption in Egypt. In 1991, per capita, fish consumption was 8 kg, and in 2009, it had reached 22.56 kg. In 18 years, the per capita consumption had increased 14 kg. It shows that Egypt's reliance on fisheries resources increased with time. It kept contributing to the food security of Egypt directly and indirectly.

Indonesia is a country with a large population. Fisheries and seafood played a vital role in providing food security to people. In 2005, 2734090 and 1164178 people had been working in primary and secondary fisheries and seafood sectors in Indonesia. [59]As shown in the 1.1 table, the per capita consumption of fisheries and seafood in 1991 was 15 kg, which had increased to 25.22 kg in 2009. It witnessed an increase of 10 kg. It shows that fisheries and seafood contributed and still contributes in providing food security to the people of Indonesia.

High Dependence Fish consumption Countries per capita consumption (kg) from 1991-2000

Years Countries	1991	92	93	94	95	96	97	98	99	2000
Sri Lanka	17	16	19	16	17	19	21	21	22	20
Bangladesh	7.84	7.92	8.40	8.41	8	9	10	10	11	12
Maldives	95	137	164	182	149	154	156	169	181	182
Malaysia	46	49	48	50	55	53	57	55	62	62
Indonesia	15	16	16	17	18	19	19	19	20	21
Thailand	22	25	27	28	31	31	29	29	30	29

[58] FAO, "FAO Fishery Country Profile - THE ARAB REPUBLIC OF EGYPT" (Rome: United Nations Food and Agriculture Organization, 2003), http://www.fao.org/fi/oldsite/FCP/en/EGY/profile.htm.

[59] FAO, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Republic of Indonesia" (Rome: United Nations Food and Agriculture Organization, 2005), http://www.fao.org/fishery/facp/idn/en.

Mauritius	-	-	-	-	-	-	-	-	-	-
Egypt	8	8	7	8	8	10	10	12	13	14
Seychelles	-	-	-	-	-	-	-	-	-	-

Source: FAO 1.1 Table

High Dependence Fish consumption Countries per capita consumption (kg) from 2001-2009

Year countries	01	02	03	04	05	06	07	08	09
Sri Lanka	20	20	20	22	21	19	20	20	21
Bangladesh	12	13	14	14	15	16	16	18	19
Maldives	182	183	189	138	127	167	109	140	158
Malaysia	62	59	62	58	54	56	57	59	60
Indonesia	21	21	20	20	21	22	22	24	25
Thailand	29	29	31	30	31	33	33	28	30
Mauritius	-	-	-	-	-	-	--	-	-
Egypt	14	15	15	14	14	16	17	17	24
Seychelles	-	-	-	-	-	-	-	-	-
Myanmar	18	19	20	27	27	33	38	43	47

Source: FAO 1.1 Table

1.3.2 Medium Dependence countries

In 1991, per capita consumption of fisheries and seafood was 20 kg and 25 KG in 2009 as shown in 1.2 Table. It signifies the importance of fish and seafood for food security in Australia's in the direct way. Fisheries and seafood also contributes to food security in Australia indirectly. According to the estimate of the World Food and Agriculture Organization, the fishing industry in Australia employed 19000 people in 2001 and indirectly employed 8000 thousand people.[60]

[60] FAO, "FAO Fishery Country Profile - Australia" (Rome: United Nations Food and Agriculture Organization, 2003), http://www.fao.org/fi/oldsite/FCP/en/AUS/profile.htm.

India is another important country in IOR. It is the second-largest country of the world in terms of population. Fishing Industry provided 14.66 million people directly; furthermore, the fishing industry's contribution was 1.67 percent in India's GDP in 2003. It also provided jobs to millions of people in the secondary industry. In India's fishing industry, 79% are full-time workers.[61] As shown in 1.2 Table, in 20 years, India's per capita food consumption has increased by 2 kg. Historically, the direct contribution of fishing industry in India didn't not remain very significant in all India. However, in the coastal communities and as an indirect sources of food security, the contribution of fishing in industry is palpable.

According to estimates FAO in 2001, 471500 and 110000 people were working in the primary and secondary sector respectively in Pakistan[62] . The per capita fish consumption in 1991 was 2.10 kg that declined to 1.94 kg in 2009. Pakistan is among a few countries where per capita consumption declined. It showed that Pakistani people are not relying on fish as a primary source of protein, and it is not a vital component of food security. However, Fish remained an important component of food security.

In Iran, 156470 people were working in the primary industry, and 234705 people were working in the secondary fishing industry. In 2003, Iran produced 394.2 million worth of seafood.[63] As shown in 1.2 table, Iran's per capita fish consumption was just 4 KG in 1991 and 7 in 2009. It showed an increase of 3 kg in three years. Fisheries and seafood consumption, historically, witnessed an increasing trend.

Kenya is a vital country in the Indian Ocean. In 2002, 60000 people were working in the primary fisheries and seafood sector, while 200000 people were working in the secondary sector.[64] As shown in the 1.2 table, in 1991, per capita consumption was 6 kg, while in 209, it decreased and reached 3 kg. It shows that Kenya is also among countries where the per capita consumption of fisheries and seafood decreased.

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[61] FAO, "Fishery Country Profile - THE REPUBLIC OF INDIA" (Rome: United Nations Food and Agriculture Organization, 2003), http://www.fao.org/fi/oldsite/FCP/en/IND/profile.htm.

[62] FAO, "FAO Fishery Country Profile - THE ISLAMIC REPUBLIC OF PAKISTAN" (Rome: United Nations Food and Agriculture Organization, 2003), http://www.fao.org/fi/oldsite/FCP/en/pak/profile.htm.

[63] FAO, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Islamic Republic of Iran" (Rome: United Nations Food and Agriculture Organization, 2003), http://www.fao.org/fishery/facp/IRN/en.

[64] FAO, "FAO Fishery Country Profile - THE REPUBLIC OF KENYA" (Rome: United Nations Food and Agriculture Organization, 2001), http://omap.africanmarineatlas.org/BIOSPHERE/data/fishes/fisheries/CountryCatches/Fishery Country Profiles/FAO Fishery Country Profile - THE REPUBLIC OF KENYA.htm.

South Africa is an important country bordering the Indian Ocean. In 2003, 16854 people were working in the fisheries and seafood industry, while 27730 people were working in the secondary sectors.[65] In 1991, per capita fisheries and seafood consumption was 7 kg that reduced to 5 kg in 2009. It witnessed a 2 kg decrease; however, it was not the first time when fisheries and seafood consumption decreased. In 2003 fisheries and seafood contributed 1 in the GDP of South Africa.

Oman is a small state in the Middle East that comes in the IOR. The Fishing industry in 1998 provided jobs to 30 thousand people in the primary sector and the secondary sectors employed 26944 people.[66] In 1991, per capita fishing consumption was at 23 kg, and in 2009 it reached 29 Kg. It saw an increase of 6 kg; it means fisheries and seafood played a significant role in providing food security to people of Oman.

In Yemen, Fisheries and seafood also played an important role. As shown in 1.2 Table, in 1991, fisheries and seafood consumption were at 6 kg which reached a peak in 2004, but it started declining after it and reached 3 kg in 2009. The fishing industry in Yemen also provided jobs to thousands of people. According to estimates of FAO, 3172 people were working in the governmental fishing sector, and 41 321 people were working in the artisanal sector. [67]

Medium Dependence Fish consumption Countries per capita consumption (kg) from 1991-2009

Years countries	1991	92	93	94	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	09
Pakistan	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1
India	3	3	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5
Iran	4	5	5	5	5	5	5	4	4	4	4	5	6	6	6	7	7	6	7
Israel	22	23	21	24	22	23	23	20	22	22	21	20	22	23	21	19	24	21	20

[65] FAO, "FAO Fishery Country Profile - THE REPUBLIC OF SOUTH AFRICA" (Rome: United Nations Food and Agriculture Organization, 2003), http://www.fao.org/fi/oldsite/FCP/en/zaf/profile.htm.

[66] FAO, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Sultanate of Oman" (Rome: United Nations Food and Agriculture Organization, 1998), http://www.fao.org/fishery/facp/omn/en.

[67] FAO, "FAO Fishery Country Profile - THE REPUBLIC OF YEMEN" (Rome: United Nations Food and Agriculture Organization, 2004), http://www.fao.org/fi/oldsite/FCP/en/YEM/profile.htm.

Australia	20	21	20	20	18	20	20	20	20	21	21	22	24	27	25	25	25	26	25
Oman	23	24	23	23	24	25	26	26	26	26	26	26	27	27	27	28	28	28	29
S.Africa	7	8	6	8	6	6	8	6	6	6	6	6	7	9	8	7	7	6	5
Kenya	6	5	5	6	5	5	5	5	6	6	4	2	2	2	3	4	3	3	3
Dijabouti	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yemen	6	6	6	5	5	4	5	5	5	4	5	6	8	9	7	6	3	2	3
Sudan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Source: FAO 1.2 Table

1.3.3 Medium High Dependence Countries:

Mozambique is another country that borders the Indian Ocean. The seafood and fisheries sector in the primary and secondary sector employed 90000 people. The Marine fish is 90 percent of the total fish production in Mozambique.[68] In 1991 per capita fish consumption was just 2 KG, and in 2009, it reached 6 kg; hence, it witnessed an increase of 4 kg.

In Tanzania, 62000 people were directly employed in the fisheries and seafood sector, while 1000000 people were working in the secondary industry. It contributed to providing food security to people in a big manner.[69] As shown in 1. 3 Table, the per capita fish consumption in 1991 was 12 kg that decreased to 6 kg in 2009. There was a decline of 6 kg. The main reason for it was that Tanzania focused on exporting the fish; thus, domestically, less fish was available. It highlights a challenge of meeting domestic consumption.

Medium Dependence Fish consumption Countries per capita consumption (kg) from 1991-2009

Year Countries	1991	92	93	94	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	2009
Madagascar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mozambique	2	1	1	1	1	1	1	1	1	1	1	1	4	4	4	5	4	5	6

[68] FAO, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Republic of Mozambique" (Rome: United Nations Food and Agriculture Organization, 2003), http://www.fao.org/fishery/facp/MOZ/en.

[69] FAO, "FAO Fishery Country Profile - THE UNITED REPUBLIC OF TANZANIA" (Rome: United Nations Food and Agriculture Organization, 2003), http://omap.africanmarineatlas.org/BIOSPHERE/data/fishes/fisheries/CountryCatches/Fishery Country Profiles/FAO Fishery Country Profile - THE UNITED REPUBLIC OF TANZANIA.htm.

Comoros	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Somalia	-	-	-	-	-	-	-	-	-	-	-		-	-	--	-	-	-	-
Tanzania	12	11	11	9	11	9	10	8	8	7	7	7	7	6	7	6	8	5	6

Source: FAO 1.3 Table

1.3.4 Per capita Consumption in low dependence countries

Saudi Arabia is an oil-rich country and few thousand people have been working in the fishing industry. In 2000, only 5887 people were working with the fishing industry directly, while 15125 were working in the secondary sector. [70] The Per capita consumption of seafood in Saudi Arabia, as shown in 1.4 Table, in 1991, was 5.50 kg, and in 2009, per capita consumption was at 11.34 kg. It showed an increase of 6 kg. Fisheries and seafood showed a trend of increase consumption, which means that they are becoming part of food security.

Kuwait is a small country, and its economy relies on oil. Fisheries and seafood did not remain a central source of employment. According to FAO, 1400 people were working in the primary sector in 2001, while 2500 people were working in the secondary industry.[71] As the number of people employed in the fish industry remained low, it didn't remain the source of food security in Kuwait. Moreover, in 1991, the per capita fish consumption was just 4.80 kg, which reached 19.80 kg in 2009. It witnessed a rise of 15 kg in 18 years. Fisheries and seafood didn't provide food security to people indirectly; nevertheless, it contributed to providing food security directly.

Jordan has a small fishing and seafood industry. In 2003, according to FAO, 700 people were working in the primary sector, and a small number of people were working in the secondary sector.[72] As shown in 1.4 Table, per capita fish consumption in Jordan in 1991 was just 3 kg, which reached 6.72 kg in 2009; hence, it witnessed a significant increase. A significant number of people were not working in the fishing industry; thus, it didn't remain an indirect source of food security. However, fisheries and seafood contributed to food security as a direct source of food.

[70] FAO, "FAO Fishery Country Profile - KINGDOM OF SAUDI ARABIA" (Rome: United Nations Food and Agriculture Organization, 2003), http://www.fao.org/fi/oldsite/FCP/en/SAU/profile.htm.

[71] FAO, "FAO Fishery Country Profile - THE STATE OF KUWAIT" (Rome: United Nations Food and Agriculture Organization, 2002), http://www.fao.org/fi/oldsite/FCP/en/KWT/profile.htm.

[72] FAO, "FAO Fishery Country Profile - HASHEMITE KINGDOM OF JORDAN" (Rome: United Nations Food and Agriculture Organization, 2003), http://www.fao.org/fi/oldsite/FCP/en/JOR/profile.htm.

Iraq is another oil-dependent country in the IOR. In 2000, in the primary fishing sector, 20000 people were working, while 4500 people were working in the secondary sector[73] In 1991, the per capita fish consumption in Iraq was 0.85 kg, while in 2009, it reached 2.67 KG. In these 18years, Iraq remained at war for the majority of years. In 2006, the per capita fish and seafood consumption increased 3.36 KG, then it started reducing again. Therefore, fisheries did not remain a significant part of food security in Iraq.

The United Arab Emirates is another important country in the Middle East, which borders the Indian Ocean. In the UAE, 18000 people were working with the fishing industry directly, and 15000 people were working in the secondary fishing industry. Per capita consumption in the UAE always remained very high.[74] In 1991, per consumption in the UAE was 20 kg, and in 2009, it reached 24 kg. During this period, the fishing consumption witnessed rise and fall many times. From 1991 to 1994, fish and seafood consumption had been increasing; hence, fish and seafood remained a vital part of food security in the UAE.

Medium Dependence Fish consumption Countries per capita consumption (kg) from 1991-2009

Year / countries	1991	92	93	94	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	09
Saudi Arabia	6	4	4	5	6	6	6	7	7	7	8	7	7	8	8	9	10	8	8
Kuwait	4	4	9	10	12	13	11	12	13	10	9	9	11	10	11	12	13	11	17
Jordan	3	3	3	3	4	5	3	4	4	3	4	4	4	5	5	5	6	7	6
Iraq	1	1	1	1	1	1	1	1	1	0.9	1	1	0.8	1	1	3	3	3	2
Singapore	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Qatar	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bahrain	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UAE	20	21	22	24	23	23	23	24	26	25	26	25	26	27	24	24	24	23	24
Sriya	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[73]. FAO, "FAO Fishery Country Profile - THE REPUBLIC OF IRAQ" (Rome: United Nations Food and Agriculture Organization, 2005), http://www.fao.org/fi/oldsite/FCP/en/IRQ/profile.htm.

[74] FAO, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The United Arab Emirates" (Rome: United Nations Food and Agriculture Organization, 2003), http://www.fao.org/fishery/facp/ARE/en.

Source: FAO 1.4 Table

1.4 History of the competition, Conflict, and Governance for fisheries in the Indian Ocean Region:

Fisheries and Seafood resources remained a source of conflict among countries in the IOR as well as in other regions. The First COD War happened between Iceland and the UK in 1958.[75] It happened when Iceland extended its fishing rights from 4 nautical miles to 12 nautical miles. The UK sent its navy ships to protect its fishing boats that led to the conflict between Iceland and the UK. In addition, it increased the nationalistic sentiments in Iceland, and it threatened to leave NATO. The Second fisheries conflict began in 1972 when Iceland expanded its fisheries right from 12 nm to 50 nm. [76]It was, although, limited-scale conflict, but with the nationalistic sentiment, in Iceland, it had become a major geopolitical issue when Iceland threatened to leave NATO. The geopolitical tensions and nationalist sentiment in countries can turn small-scale fisheries conflict into a major war. Historically, the IOR always had many fisheries conflicts.

1.4.1 The Palk bay Conflict between India and Sri Lanka:

The Palk Bay area between India and Sri Lanka remained rich in biodiversity and fisheries resources. The fishing resources in these areas are vital for the coastal communities of both the countries. The important aspect of this area when it comes to fisheries and seafood is that it has low current and latitudinal biodiversity that makes fishing easy in this area.[77] Despite the easy access to fishing and seafood resources, the problem started after 1960 because of the economic crisis in India.

In 1960, India was facing economic problems and due to these financial problems, the Indian government was finding new ways to improve its economic conditions. They highlighted seafood as an area where the Indian government could invest to improve the economic conditions. The Indian government subsidized the fishing boats. As a result, the Indian state's sponsored big

[75] Paddy Johnston and By Paddy Johnston, "Cambridge Review of International Affairs The Cod Wars against Iceland : The Royal Navy as Political Instrument The Cod Wars against Iceland : The Royal Navy as Political Instrument," no. January 2015 (2007): 37–41, https://doi.org/10.1080/09557579108400062.

[76] Sverrir Steinsson, "The Cod Wars: A Re-Analysis," *European Security* 25, no. 2 (2016): 256–75, https://doi.org/10.1080/09662839.2016.1160376.

[77] Klaus Rohde, "Latitudinal Gradients in Species Diversity: The Search for the Primary Cause," *Oikos* 65, no. 3 (1992): 514, https://doi.org/10.2307/3545569.

businesses came into the fishing industry; furthermore, the Indian government was of the view that this inclusion of new technology could increase its fishing yield. [78]

Source: Sri Lankan government *Map. 2 the Palk Bay conflict*

This policy changed the fishing methods, and with the inclusion of big players in the fishing industry, the need for fisheries and seafood started increasing. The Indian fishermen who were living in the area of Rameswaram started adopting the process of trawling and started using nylon nets instead of traditional nets. Since a massive weight attached to these nets and powerful motorboats were pulling these nets, it increased the production, albeit damaging the local resources; consequently, motorboats with the help of nylon nets started destroying biodiversity, and the Indian fishermen started moving out of their traditional fishing grounds.[79] It highlights the impact of new technology and an increase in demand can increase fisheries conflict.

Historically, Fishermen of both countries used to fish in the Palk bay without following any rules and regulations. In 1984, the government of Tamil Nadu state passed a regulation that stopped mechanized fishing boats from fish in a 3 miles area from the coast; however, the government didn't take any steps to enforce these regulations.

In 1970, India and Sri Lanka formerly demarcated their maritime boundaries. During this agreement, India gave the Island of Kachchatheevu to Sri Lanka. The New Dehli government signed this agreement with the government of Sri Lanka; however, the state government of Tamil Nadu disagreed with it. From their point of view, for the Indian government, it was a necessary step to improve the bilateral relationship with the Sri Lankan government. Meanwhile, the Tamil

[78] John Kurien, "Entry of Big Business into Fishing, Its Impact on Fish Economy," *Economic & Political Weekly* 13, no. 36 (1978): 1557–65.
[79] Kurien.

Nadu State kept claiming it as a part of India; nevertheless, the Indian government relied on the principle of sovereignty and kept the agreement with the Sri Lankan government.[80]

The Indian Foreign minister Swaran Singh had the view that despite giving the Island to Sri Lanka Indian Fishermen enjoyed fishing rights around the island, and participated in the saint Anthony festival without obtaining a visa from the Sri Lankan government. The opponents of this decision argued that the 1976 boundary agreement has further reduced the number of Indian fishermen around the island.

The Indian Fishermen kept fishing in the area of Palk bay despite the maritime demarcation agreement, because Sri Lanka had been engulfed in the ethnic conflict. The Sri Lankan navy was performing security duties, and they were not paying attention to the encroachment of the Indian Fishermen in Sri Lankan waters.

The concern was increasing the number of trawlers. In 1986, three districts of Palk bay had 1568, which increased to 3339 in 2000. After the change of the Indian government fishing policy, the Indian fishing production has increased as well. There was a 5400 percent increase in fishing production. Therefore, it increased the conflict as well.

The Palk bay conflict is still going on. Multiple variables are further exacerbating the conflict between fisheries and seafood. From the perspective of International Law, the both states have signed the International Conventional on the Law of Sea. Under part XV of UNCLOS, the Tribunal has jurisdiction over it; nevertheless, both countries didn't approach UNCLOS for the resolution of this dispute. [81]

1.4.2 Bangladesh Myanmar fishing dispute:

Bangladesh and Myanmar also have a maritime dispute with each other, although fisheries were not the only driver of the conflict between Myanmar. Saint Martin's Island has been part of Bangladesh, since its independence from Pakistan. Its size is just nine square kilometers.

[80] Sri Lanka and India, "Agreement between Sri Lanka and India on the Boundary in Historic Waters between the Two Countries and Related Matters" (2002).

[81] United Nations, United Nations Convention on the Law of the Sea (The US, issued 1982).

The tension between the navy of Myanmar and Bangladesh remained very high. In 1998, the Barman navy killed 9 Bangladeshi fishermen just near the island. Later in 1999, it again killed another Bangladeshi fisherman. The tension remained very high between the two countries.[82]

Historically, Saint Martin Island was part of British India, Myanmar separated from it in 1937. When Pakistan in 1947, it became part of Pakistan. In 1974 both countries had prolonged discussions on the maritime border delimitation 1974, and Myanmar accepted it as a part of Bangladesh. The Bangladeshi government went into international tribunal on the Law of Sea for border demarcation of its maritime time boundaries.[83]

1.4.3 India Bangladesh Fishing Conflict History:

India and Bangladesh had maritime border delimitation conflicts as well. Both Countries claimed sovereignty over part of the Bay of Bengal. The primary driver behind the dispute was the possibility of oil and gas resources in the Bay of Bengal and Fisheries resources. Both countries disagreed with the interpretation of the legality of this issue and applications of facts on these legal arguments[84]. The maritime disputes can be resolved by the application of articles 15, 74, and 83 of UNCLOS. Both countries were defining those articles differently. Both India and Bangladesh were required to adopt diplomatic means to resolve the conflict according to part XV of section 1 of UNCLOS. India and Myanmar resolved their maritime dispute based on equitable distance. [85]Bangladesh took the case to an international court, and the court resolved it. Despite the resolution of maritime issues, fisheries conflict still present.

1.4.4 India Pakistan Fisheries Conflict:

Sir Creek is a maritime dispute between India and Pakistan. Although Sir Creek was part of Sindh, it was later included in the Bombay presidency. The resolution that divides two territories marks Sir Creek as the part of Sindh. India evokes Thalweg doctrine in its support, which states that a

[82] Md Monjur Hasan and He Jian, "Protracted Maritime Boundary Dispute Resolutions in the Bay of Bengal: Issues and Impacts," *Thalassas* 35, no. 1 (2019): 323–40, https://doi.org/10.1007/s41208-019-0126-1.
[83] Myo AUNG, "THE MYANMAR AND BANGLADESH MARITIME BOUNDARY DISPUTE," *THE INTERNATIONAL CRISIS GROUP ON MYANMAR* 1, no. NOVEMBER 2018 (2019), https://doi.org/10.13140/RG.2.2.27953.02404.
[84] AUNG.
[85] Sunil Kumar Agarwal, "India-Bangladesh Maritime Dispute: An International Law Perspective," *Maritime Affairs: Journal of the National Maritime Foundation of India* 6, no. 1 (2010): 28–50, https://doi.org/10.1080/09733159.2010.508241.

river channel can be divided, if both nations agree. Pakistan rejects the law by arguing that the law doesn't apply here, because Sir Creek is not navigable; however, India argues that it is navigable in high tide. [86] This area is important for fisheries resources and Pakistan loses millions of dollars due to illegal Indian Fishermen. The main fish species found in this area are: squid, ribbon fish, red snapper, tiger prawn. Indian Fishermen continuously encroach on the Pakistani side, while searching for Fisheries and Seafood species. Security forces of the both sides arrest fishermen to exercise sovereignty.[87]

1.5 History of Fisheries and seafood governance in India Ocean Region:

Undertaken Research is about Food Security Competition for Fisheries and Seafood in the Indian Ocean. To develop an understanding of competition, an analysis of the governing history of the governing institution is very important.

The Indian Ocean region has many institutions that were formed to institutional governance-related fisheries and seafood. The first of such an institution that was formed is: The Indian Ocean Tuna Commission.

1.5.1 The Indian Ocean Tuna Commission:

The idea of the Indian Ocean Tuna commission was formed in 1993, nevertheless, it was formally formed in 1996. It is an intergovernmental organization that manages and coordinates the tuna species in the Indian Ocean Region. Its formation was the result of a multilateral agreement between FAO members in 1993. This treaty is known as the Agreement for Establishment of the Indian Ocean Tuna Commission. Any country of the Indian Ocean region that has a coastline with the Indian Ocean or any other country that fish for Tuna in the Indian Ocean can become a member of this commission. [88] Besides, the regional economic organization can also become a member of the Indian Ocean Tuna Commission.[89]

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[86] Raghavendra Mishra, "The 'Sir Creek' Dispute: Contours, Implications and the Way Ahead," *Strategic Analysis* 39, no. 2 (2015): 184–96, https://doi.org/10.1080/09700161.2014.1000672.

[87] Md. Monjur Hasan et al., "Protracted Maritime Boundary Disputes and Maritime Laws," *Journal of International Maritime Safety, Environmental Affairs, and Shipping* 2, no. 2 (2019): 89–96, https://doi.org/10.1080/25725084.2018.1564184.

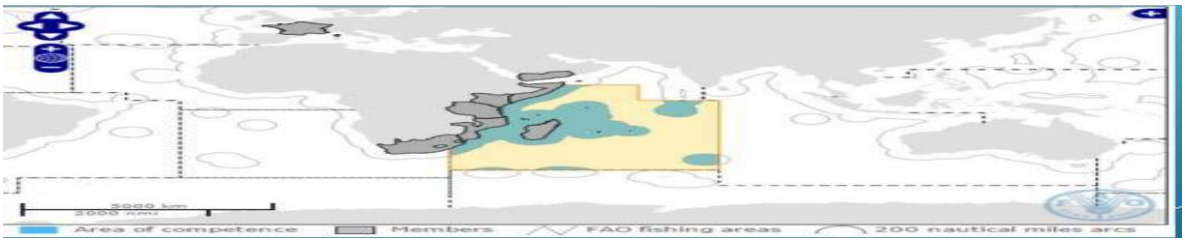
[88] FA0, "Agreement for Establishment of the Indian Ocean Tuna Commission" (Rome: FAO, 1996), https://treaties.un.org/Pages/showDetails.aspx?objid=08000002800a7f47.

[89] Angela Abolhassani, "Tuna Fisheries and Geopolitical Change: Coastal and Fishing Country Tensions Resurface at the Indian Ocean Tuna Commission," *Australian Journal of Maritime and Ocean Affairs* 10, no. 1 (2018): 35–41, https://doi.org/10.1080/18366503.2017.1367061.

It was an organization that replaced the Indo-Pacific Tuna Development and management program. Till now, 31 states have become members of this commission.

1.5.2 Southwest Indian Ocean Fisheries Commission:

The southwest Indian Ocean Fisheries Commission was formed in 2005. The purpose of its formation was to provide advice to countries of southwest Indian Ocean countries related to fisheries management. This Commission was formed under article VI, FAO constitution. It deals with fisheries management in the Exclusive Economic Zones of 12 countries. The names of those countries are as follows: Comoros, France, Kenya, Madagascar, Maldives, Mauritius, Mozambique, Seychelles, Somalia, South Africa, and UN. Rep. of Tanzania, Yemen. [90]



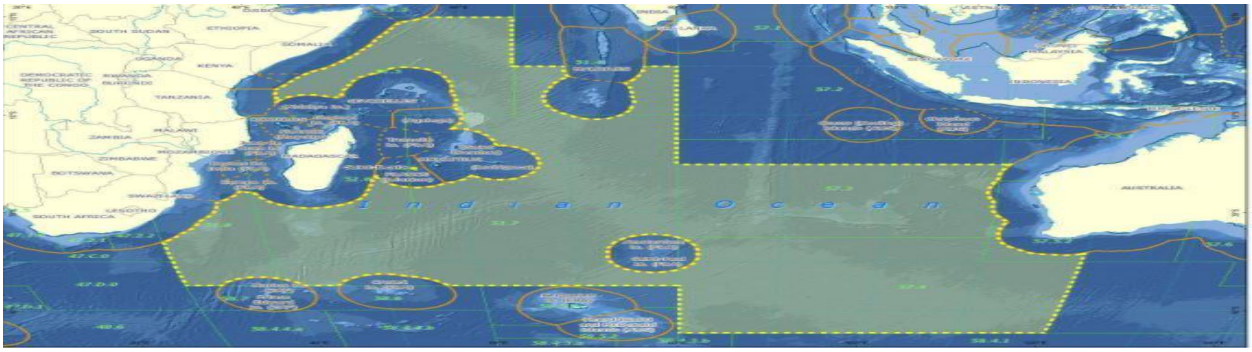
Source. FAO *map 3. Southwest Indian Ocean Fisheries Commission map*

1.5.3 Southern Indian Ocean Fisheries Agreement:

Another agreement that deals with the management of Fisheries in the Indian Ocean region is the Southern Indian Ocean Fisheries Agreement. The basic aim of this agreement is to manage fisheries resources. It also performs monitoring, surveillance of fisheries resources. It also demands a certain commitment of countries to comply with its rules. It also has a scientific committee that accesses the fisheries resources in the Southern Indian Ocean.[91]

[90] Md Saiful Karim, Erika Techera, and Abdullah Al Arif, "Ecosystem-Based Fisheries Management and the Precautionary Approach in the Indian Ocean Regional Fisheries Management Organisations," *Marine Pollution Bulletin* 159, no. June (2020): 111438, https://doi.org/10.1016/j.marpolbul.2020.111438.

[91] Zoe Scanlon, "Incorporating Taiwan in International Fisheries Management: The Southern Indian Ocean Fisheries Agreement Experience," *Ocean Development and International Law* 48, no. 1 (2017): 35–51, https://doi.org/10.1080/00908320.2017.1265364.



Source: FAO *map. 5 Southern Indian Ocean Fisheries Agreement*

This agreement came into force after six years of initial signatures. It is composed of ten contracting parties. These contracting countries are as follows: Australia, China, the Cook Islands, the European Union, and France on behalf of its Indian Ocean Territories, Japan, the Republic of Korea, Mauritius, Seychelles, and Thailand. It also has non-signatory parties including Comoros, Kenya, Madagascar, Mozambique, and New Zealand. These countries have cooperated with the commission, but they haven't formally rectified it.[92]

Indian Ocean Commission:

Indian Ocean Commission is an intergovernmental organization that links together African countries of IOR. This commission was formed in 1982 in Mauritius, and it's headquarter is still in Mauritius. This commission consists of the following countries: Comoros, Madagascar, Mauritius, Réunion (an overseas region of France), and Seychelles. It also has observer states, which include China, India, the European Union, the sovereign order of Malta. It was established as a multi-purpose commission that deals with political and economic issues. In addition, it includes sustainable maritime fishing in its goals, which makes it a relevant organization related to fisheries and seafood. [93]

[92] Scanlon.

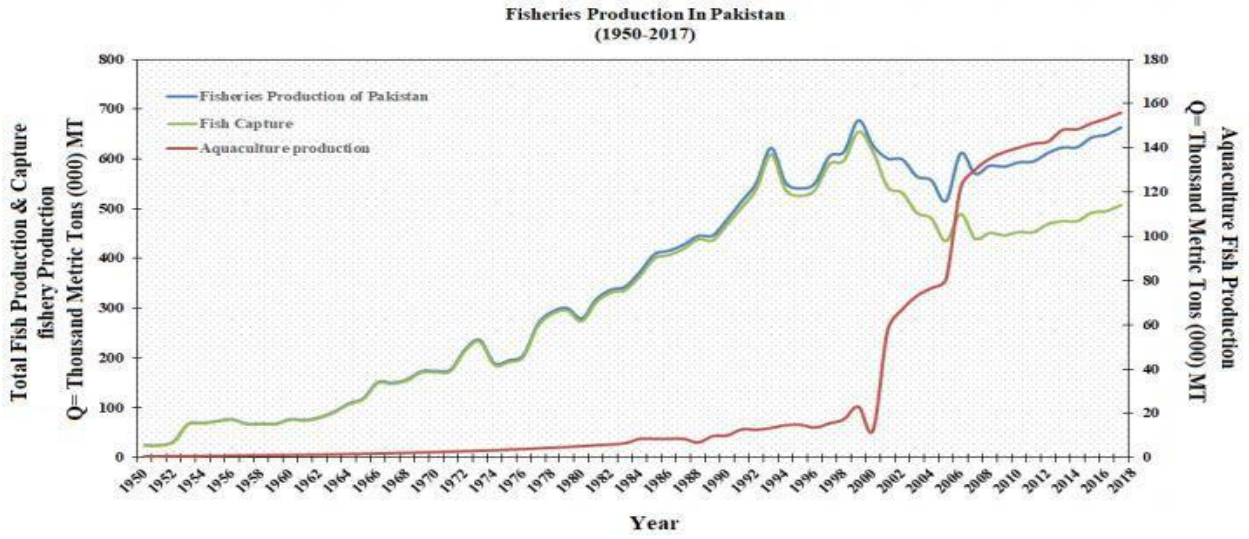
[93] Sam Bateman and Anthony Bergin, "Building Blocks for Maritime Security in the Indian Ocean," *Ocean Development and International Law* 27, no. 3 (1996): 235–54, https://doi.org/10.1080/00908329609546082.

Source. FAO *map. 6. Indian Ocean commission map*

1.6 Pakistan and Fisheries and Seafood resources:

Undertaken research explores the challenges and opportunities for Pakistan in the fisheries sector. It is important to analyze the historical background of the Fisheries and Seafood sector. The consumption of fisheries and seafood remained very low.[94] In 1991, the per capita consumption of fisheries in Pakistan was 2.40 kg, which decreased to 1.94 kg in 2010. The historical data of Pakistan's fish consumption shows that Pakistan never relied on fisheries for food security.[95] Historically, Pakistan fisheries and seafood production came from the capture fisheries. In 1950, after 3 years of independence Pakistan's capture production remained very low. It just produced 24451 MT. From 1950 to 1959, the total catch remained 556994 MT, and it shows that the fisheries production remained low in the initial decade. In 2001, out of the total capture fisheries the share of marine capture was 72 percent, while the share of inland capture was 28 percent. The Marine Fisheries produced 435913 tonnes, while the share of inland capture fisheries and seafood was 166483 tonnes; moreover, the total captured production was 591658 tonnes.

[94] Ahmed Memon, "Fish Consumption in Pakistan Lowest in the World," *Pakistan Food Journal* Jan-Feb, no. 5 (2017): 3, http://www.foodjournal.pk/2015/March-April-2015/PDF-March-April-2015/Dr-Noor-Sea-food.pdf.
[95] Memon.



Source. FAO *Figure 1. Fisheries production in Pakistan*

Historically, Pakistan relied on the capture fisheries and seafood, and the aquaculture production remained low in Pakistan, but after 2001, the share of aquaculture in fish production increased, and after 2005, its share in Pakistan's fish production increased than capture fisheries. Despite the increase in fish production in Pakistan, fisheries direct contribution to food security remained very low. Most of the captured fish in Pakistan had been used domestically. In 2001, 413138 metric tonnes of marine capture was used domestically, while 83521 metric tonnes was exported. A large portion of capture fisheries was used as poultry feed and didn't become a direct source of food security. However, thousands of people remained associated with the fisheries industry in Pakistan; therefore, it played a vital role in providing indirect food security, and it also contributed in providing direct food security for people living in coastal areas. According to estimates of FAO, 471500 people remained associated with the fisheries industry in Pakistan in 2001.[96]

Pakistan mainly exported 14881 tonnes of shrimp. Its value was around 60.5 million dollars. Pakistan exported 55734 tonnes of fish. Its value was around 54.3 million dollars. The main markets for fish export are Singapore and Gulf countries. These are countries of IOR. Pakistan can further increase fish production. Pakistan exported shrimps to Europe, China, the US, Japan, and

[96] Syed Babar Hussain Shah et al., "An Economic Analysis of the Fisheries Sector in Pakistan (1950-2013)," *International Journal of Fisheries and Aquatic Studies* 6, no. 2 (2018): 515–24.

to the countries of the Near East. The per capita consumption of seafood and fisheries remained very high in these countries. [97]

Historically, Pakistan also faced the problem of overexploitation. As mentioned above, Shrimp remained the most valuable item of the Pakistani fishing industry. This is the reason the shrimp fleet is increasing, which is harming the fishing industry. According to FAO Pakistan, only 500 to 600 fish trawlers, but the size of Pakistani shrimp fleet is three-time bigger than this. It didn't help in increasing the production of shrimps. As a result of this, the quality of the shrimp catch is decreasing. It led to the overexploitation of brown and pink shrimps. The other shrimp species are facing a burden due to the overexploitation of brown and pink shrimps.[98]

Conclusion:

Historically, food security remained an important concept for states. It was just not a matter of domestic concern, but a matter of national importance. Furthermore, countries were realizing the importance of human security; however, they were not calling it human security explicitly. Fisheries and seafood remained an important component of food security. Fisheries and seafood consumption was increasing. Countries are consumption more fisheries and seafood products. Furthermore, the demand for fisheries have increased. Historically, there were many fisheries conflict in the Indian Ocean region, and governance mechanism were also established to reduce challenges in fisheries and seafood management. As far as Pakistan is concerned, fisheries and seafood consumption remained low in Pakistan. Fisheries and seafood didn't play any significant role in providing food security to Pakistani people. Furthermore, Pakistan had a fisheries conflict with India.

[97] FAO, "FAO Fishery Country Profile - THE ISLAMIC REPUBLIC OF PAKISTAN" (Rome: FAO, 2003), http://www.fao.org/fi/oldsite/FCP/en/pak/profile.htm.
[98] FAO.

Chapter 2: Fish and Food Security in the Indian Ocean Region

The Indian Ocean region consists of 37 countries; every country has its dynamics of food security. Fisheries plays role in providing food security from many aspects. In some countries, it provides direct food security, because people eat fisheries and seafood. In other countries, it becomes an indirect Part of food security. Fisheries in both supports human life. In one way, it provides essential nutrients such as protein, Vitamin D, and other important minerals. In other way, it becomes source of economic strengthen for people. The income that they get from fisheries and seafood become part of the economy. Therefore, fisheries and seafood are important in the both manners.

Undertaken research in this chapter divide countries into groups according to WWF fisheries dependence Index, as it did in the previous chapter. Undertaken research uses the four main parts of the FAO food security definition that are: Physical access, economic access, Preference, and nutritional aspect. Undertaken research finds out about these aspects using different variables such as production, self-sufficiency in production, per capita supply, and calculates percentage of fisheries and seafood obtained from the Indian Ocean. To find out of economic access, Undertaken research uses EIU food security ranking and affordability score, percentage of population below the global poverty line, Per capita GNI, and it finds out that whether a country in LIFDC or not. To find out preference of people, it checks per capita consumption of people, and to check nutritional importance of fisheries, it finds out percentage of protein obtained from fisheries; in addition, the Global Hunger Index, and Percentage of population facing undernourishment. To calculate production dynamics 7 years of fisheries and seafood data was used. In other variables latest avaible data was used.

2.1 Importance of Fish and seafood in Food Security in the Indian Ocean Region:

The importance of fish and seafood, in food security, varies from country to country. Undertaken research uses the definition of the United Nations Food and Agriculture Organization to know the importance of fish and seafood in the food security of IOR states. The FAO defines food security as “Food Security exists when all the people, all the time, have physical and economic access to

sufficient, safe, nutritious food that meets their dietary needs and food preference for an active and healthy life". [99]This definition of food security highlights three cardinal aspects of food security. The first aspect is availability, the second is economical, and the third is nutritional. To know how fish and seafood contribute to food security, knowledge about the physical availability of food is vital. If people don't have physical access to fish and seafood, then it will not play an important role in food security. To stabilize physical access to food, the production of food is vital. The economic aspect is the second most important variable in the definition of food security. [100]

Without having sufficient economic power, people won't be able to make fish and seafood a vital component of their food that is why it is rudimentary in the definition of food security.[101] After the economic aspect, the definition of food security highlights the nutritional importance of food. Food must have the required nutrients to fulfill the demand of people. [102]

The definition of food security also points out the preference of people. To acquire food security, meeting the preferences of people is also paramount. People must have access to the food they want to eat. Food must not only meet dietary needs but also fulfills nutritional preferences. Even if the food meets the nutritional requirements, it is not according to their preference, it will fall short of providing food security. [103]

Undertaken research analyzes the production, affordability, and per capita consumption, the reliance of people on fish and seafood for their nutritional needs to highlight the importance of fish and seafood in providing food security.

Undertaken research deals with the fisheries and seafood products obtained from the Ocean; therefore, undertaken research first calculates the percentage of marine capture fisheries and seafood, and then to measure the self-sufficiency, undertaken research uses this formula of FAO to determine the countries' self-sufficiency. According to this formula, a country has self-

[99] Mark Gibson, "Food Security—A Commentary: What Is It and Why Is It So Complicated?," *Foods* 1, no. 1 (2012): 18–27, https://doi.org/10.3390/foods1010018.

[100] D. John Shaw, "World Food Summit, 1996," *World Food Security*, 2007, https://doi.org/10.1057/9780230589780_35.

[101] Shaw.

[102] Nahla Hwalla, Sibelle El Labban, and Rachel A. Bahn, "Nutrition Security Is an Integral Component of Food Security," *Frontiers in Life Science* 9, no. 3 (2016): 167–72, https://doi.org/10.1080/21553769.2016.1209133.

[103] William Bellotti, Esta Lestari, and Karen Fukofuka, "A Food Systems Perspective on Food and Nutrition Security in Australia, Indonesia, and Vanuatu," in *Advances in Food Seurity And Sustaibality*, ed. DAVID BARLING and JESSICA FANZO, First (London: Acadmic Press, 2018), 348.

sufficiency in fisheries and seafood production, if the value of exports is greater than the value of imports. Consequently, country has a sufficient amount of fisheries and products.[104]

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With it, undertaken research uses per capita fish supply to measure the availability of fisheries and seafood from the FAO Fisheries and seafood balance sheet.

To analyze the economic access, the Economist Intelligence Unit Food Security Index score, EIU affordability score, percentage population under the poverty line, per capita GNI score, and categorization of LIFDC will be used.

To know the preference of people, undertaken research uses the per capita consumption of fisheries and seafood. To know the importance of fisheries and seafood in nutritional security, undertaken research uses FAO balance sheets to calculate the percentage of animal protein obtained from fisheries and seafood. Undertaken research also uses the Global Hunger Index score, Prevalence of undernourishment to know about a country's dependence on fisheries and seafood. Fisheries resources also contribute to the GDP of a country, but fisheries and seafood data is reported with agricultural data. Therefore, to obtain authentic value of fisheries and seafood in GDP is not possible.

Undertaken research paints a picture of the contribution of fish and seafood to food security in IOR. Undertaken research separately divides countries into four groups on the basis of WWF Fisheries Dependence Index. In the first category, the countries that heavily rely on fisheries and seafood are placed. In the first category of high dependence following countries lie: Sri Lanka, Bangladesh, Maldives, Myanmar, Thailand, Malaysia, Indonesia, Egypt, Mauritius, and Seychelles. The second category consist of 6 countries, and those countries are, Madagascar, Mozambique, Tanzania, Somalia, Comoros, and Sudan; furthermore, in the third category of medium dependence, these countries are included: Pakistan, India, Australia, Oman, Israel, South Sudan, Kenya, Djibouti, and Yemen, and in the last categories of low dependence Saudi Arabia, UAE, Kuwait, Singapore, Qatar, Bahrain, and Iraq are included.

Undertaken research explains the four dynamics of food security in these countries. First, it explains production dynamics to measure the physical access, then it measures economic,

[104] Jennifer Clapp, "Food Self-Sufficiency : Making Sense of It , and When It Makes Sense," *Food Policy* 66 (2017): 88–96, https://doi.org/10.1016/j.foodpol.2016.12.001.

preference, and Nutritional Dynamic separately in the above mentioned four categories of countries.

2.2 High Dependence Countries on Fisheries and Seafood

Undertaken research divides countries in four groups. In high dependence groups those countries are placed that according to the WWF, rely on fisheries and seafood resources more than any other country in IOR. These countries are highly dependent on fisheries and seafood resources. Undertaken research describes here the production dynamic of fisheries and seafood here. It is to study physical access of people to fisheries and seafood. Without Physical access fisheries and seafood cannot become part of food security. Then it describes the economic dynamics. After it, describes dynamic of preference, and nutritional dynamic.

2.2.1 The Dynamics of Fisheries Production in Highly Dependent Countries:

For food security people's physical access to seafood and Fisheries is essential. To maintain steady physical access, the production of food is vital. There should be enough supply of food either through production or through the import of food items. Firstly, Undertaken research discusses the dynamics of production of fisheries and seafood in the countries that highly depend on fisheries resources.

Sri Lanka, which is an island nation, is located in the Indian Ocean region. Fish and seafood play a crucial role in providing food security to the people of Sri Lanka. In Sri Lanka, fisheries production is increasing every year since 2011. Fish and seafood captured from the Indian Ocean play a vital role in providing food security in Sri Lanka. In 2011, fisheries production was 426768 tonnes, which kept increasing every year. In 2012, fisheries production reached 473834 tonnes.[105] In 2014, fisheries production was 527827 tonnes and, in 2018, it was 510208. The Marine capture contribution was 81 % of the total production, and the value of its imports is greater than its exports — it means that it doesn't have self-sufficiency in the production of fisheries and seafood; however, the per capita supply of fisheries and seafood 30 kg,[106] which means that Sri Lanka is

[105] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Democratic Socialist Republic of Sri Lanka," FAO Website, 2019, http://www.fao.org/fishery/facp/LKA/en.

[106] United Nations Food and Agricuture Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*, ed. United Nations Food and Agricuture Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO Annuaire. Statistiques Des Pêches et de l'aquaculture 2018/FAO Anuario. Estadísticas de Pesca y Acuicultura 2018* (Rome: United Nations Food and Agriculture Organization, 2018), https://doi.org/10.4060/cb1213t.

ensuring physical availability through the import of fisheries and seafood products.[107] After Sri Lanka, Bangladesh is another country in the category of high dependence countries.

In 2011, captured seafood and fisheries contributed 1600918 tonnes in Bangladesh, which has reached 1871227 tonnes in 2018, while in 2011 contribution of aquaculture was 1523759, which increased to 2405416 tonnes. The total average production from 2011 to 2018 was 3, 648, 09 tonnes. The contribution of marine capture was 16 percent out of the total production. The value of its imports is greater than the value of its exports— so, it is not self-sufficient in seafood and fisheries production.[108] After Bangladesh, the undertaken research discusses the dynamic of fisheries and seafood production in Maldives.

The Republic of Maldives is an island nation. Its dependence on fisheries and seafood for meeting food security needs is extremely palpable. Seafood and fisheries play a significant role in meeting the needs of food security. Marine fisheries are a major source of food security in the country. In 2011, marine capture contributed 120835 tonnes, which reached 151013 tonnes in 2018. A large chunk of captured fish and seafood products were used to meet the domestic demand. The contribution of marine capture in the total production is 100 percent. The value of Maldives' exports is greater than the value of its imports; therefore, it is self-sufficient in the production of Fisheries and seafood. [109] After Maldives, the undertaken research discusses Mauritius' fisheries and seafood production dynamics.

Mauritius has the largest exclusive economic zone, which is spreading in the area of 1.28 million square kilometers. The total production of fish and seafood is increasing in Mauritius. In 2011, the total production of fisheries and seafood was 7508 tonnes, which reached 30 thousand tonnes in 2018, whereas in 2011, the contribution of capture fisheries was 7300 tonnes, which reached 28314 tonnes in 2018, and the contribution of aquaculture was 537 tonnes in 2011, which reached 2000 tonnes in 2018. Out of total capture fish and seafood, the contribution of marine fish and seafood was 7306 tonnes in 2011, which reached 28314 tonnes in 2018, and the contribution of inland

[107] Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Democratic Socialist Republic of Sri Lanka."

[108] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The People's Republic of Bangladesh," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/fishery/facp/BGD/en.

[109] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Republic of Maldives," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/fishery/facp/MDV/en.

capture was zero tonnes after 1993. The total average production of fisheries and seafood was 16,359 tonnes, and the share of marine production was 94 percent.

In 2011, it imported 298 million dollars' worth of fish and seafood products, while in 2018 it imported 312 million dollars' worth of seafood and fisheries products, it exported 278 million dollars' worth of seafood and fisheries products in 2011, which has increased to 458 million dollars' worth of fisheries and seafood products in 2018. The value of exports is greater than the value of imports; therefore, Mauritius is self-sufficient in the production of fisheries and seafood products; therefore, people have physical access to fish and seafood. Thailand is another country that relies heavily on fisheries and seafood, and the production dynamics of fisheries and seafood are not different from Mauritius.

In Thailand, the contribution of captured fisheries was 2.6 million tonnes in 2006, which declined to 1.8 million tonnes in 2011, while captured fish and seafood contribution was 1.7 million tonnes in 2018. The production of aquaculture also witnessed a decline as compared to the past years. In 2009, the contribution of aquaculture was 1.9 million tonnes, which declined to 0. 8 million tonnes in 2018. The decline in production was because of the reduction in marine capture. The average production in the past eight years was 2,665,735 tonnes, and the average marine capture production was 461,588 tonnes in the past eight years. The share of marine capture fisheries and seafood was 54 percent. The value of its exports is less than the value of its import; thus, it is not self-sufficient in the production of fisheries and seafood. [110] After Thailand, the undertaken research discusses Myanmar.

In 2011, the contribution of the capture fisheries and seafood was 1.975 million tonnes in Myanmar, which reached 2.1 million tonnes in 2017, and in 2018, it was 2 million tonnes. In 2011, the contribution of marine capture was 1.17 million tonnes, and in 2018, the contribution of marine capture was 1.14 million tonnes, while in the same year, the contribution of inland capture was 0.7 million tonnes and 0.8 million tonnes. The total average production in the past 8 years was 2,355,799, and the contribution of marine capture fisheries and seafood in the total production was 48 percent.[111] The per capita supply of fisheries and seafood was 45 kg. The value of its exports is

[110] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Kingdom of Thailand," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/fishery/facp/THA/en.

[111] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Republic of the Union of Myanmar," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/fishery/facp/MMR/en.

greater than the value of its imports; therefore, it is self-sufficient in the production of fisheries and seafood. After Myanmar, the undertaken research discusses the production dynamics of fisheries and seafood in Malaysia.

The production of fisheries remained relatively stable. In 2011, the contribution of captured fish and seafood was 1.375 million tonnes, which reached 1.5 million tonnes in 2016, and in 2018, it declined to 1.4 million tonnes. The share of marine capture was 0.84 million tonnes in 2011, which declined to 0.5 million tonnes in 2018, while the contribution of inland capture was 0.122 million tonnes in 2011, which declined to 0.10 million tonnes in 2018. The total average production in the past 8 years was 1,728,445 million tonnes, and the share of marine captured fisheries and seafood in the total production was 85 percent. [112]Malaysia also imports and exports fish and seafood products. The value of its exports is smaller than the value of its imports; therefore, it is not self-sufficient in the production of fisheries and seafood; however, the per capita supply is 52 kg in Malaysia. With Malaysia, its neighboring country Indonesia has a similar reliance on fisheries and seafood.

The contribution of captured fish and seafood was 5.7 million tonnes in 2011 in Indonesia, which reached 7.2 million tonnes in 2018. Out of the total capture production, the contribution of marine production was 5.38 million tonnes in 2011, which reached 6.7 million tonnes in 2018, while the share of inland capture was 0.3 million tonnes in 2011, which reached 0.5 million tonnes in 2018. The total average production in the past 8 years was 10,996,083 tonnes, and the total average marine production was 5,988,538 tonnes; the share of marine production was 55 percent. [113] Indonesia also exports a large number of fish and seafood products. In 2013, it exported 3 billion dollars' worth of fish and seafood products. The value of its exports is greater than the value of its imports; therefore, it is self-sufficient in the production of fisheries and seafood. The average per capita supply is 44 kg.[114] After Indonesia, the undertaken research discusses Seychelles.

The production of food is fluctuating in Seychelles. In 2011, total capture production was 75481 tonnes, which reached 145614 tonnes in 2018. The total production of fisheries and seafood was

[112] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - Malaysia," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/fishery/facp/MYS/en.

[113] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Republic of Indonesia," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/fishery/facp/IDN/en.

[114] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

obtained from marine capture. It means that fisheries and seafood play an important role in food security in Seychelles. In the past 8 years, the total average production was 101,737, and the share of marine contribution was 100 percent.

In 2011, it exported 362 million US dollars worth of fisheries and seafood, which reached 462 million dollars in 2018, while it imported 132 million dollars worth of fisheries and seafood products, which reached 163 million dollars in 2018. Its exports are far greater than its imports; hence, Seychelles has self-sufficiency in fisheries and seafood. The per capita supply in Seychelles was 56 kg. [115] After Seychelles, Undertaken research discusses fisheries and seafood dynamics in Egypt.

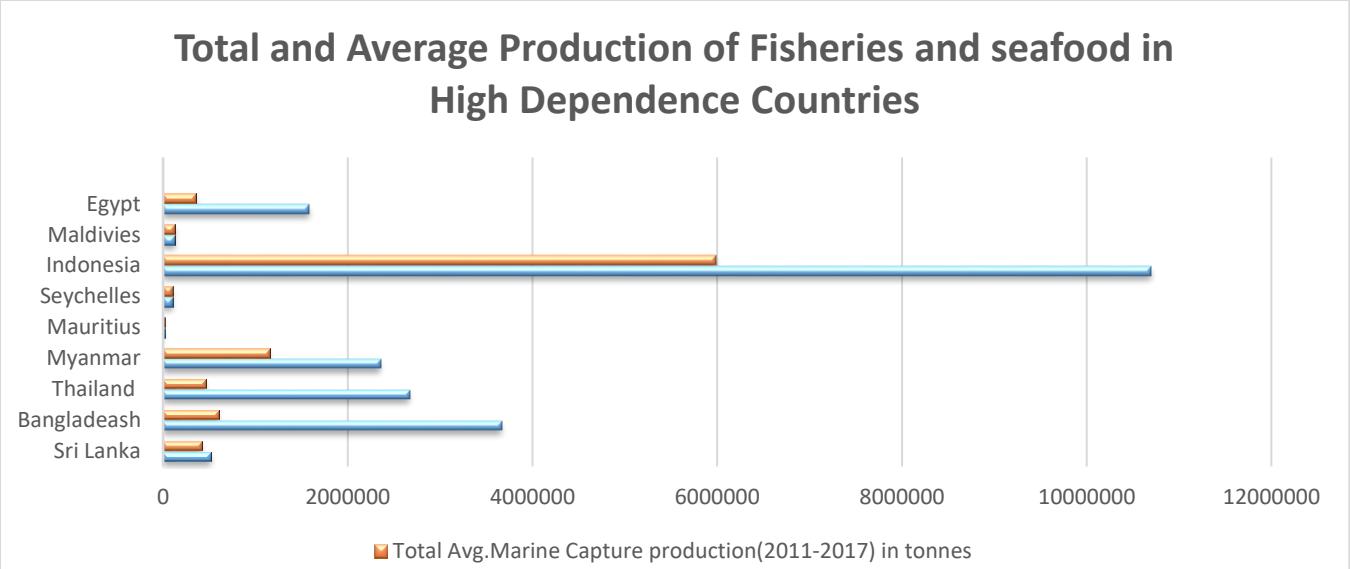
In 2011, the total production of fisheries and seafood was 1,362,165 tonnes In Egypt. Out of the total production, the contribution of capture fisheries was 375,345 tonnes, and the contribution of Aquaculture 986,820 tonnes, whereas in 2018, the contribution of capture production was 373,285 tonnes, while the contribution of aquaculture was 1561457 tonnes in 2018. Out of the total production of seafood and fisheries, the classification of marine capture and inland capture wasn't available. The total average production in the past 8 years was 1581640, and the share of capture production was 22 percent.[116]

In 2015, it imported 767 million dollars' worth of fisheries and seafood products, while in 2018, it imported 914 million dollars' worth of fisheries and seafood products, whereas, in 2015 and 2018, it exported 31 and 35 million dollars' worth of fisheries and seafood products respectively. The value of imports is greater than exports, which means that it is not self-sufficient in the production of fisheries and seafood. [117]

[115] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Republic of Seychelles," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/fishery/facp/SYC/en.

[116] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[117] Organization.



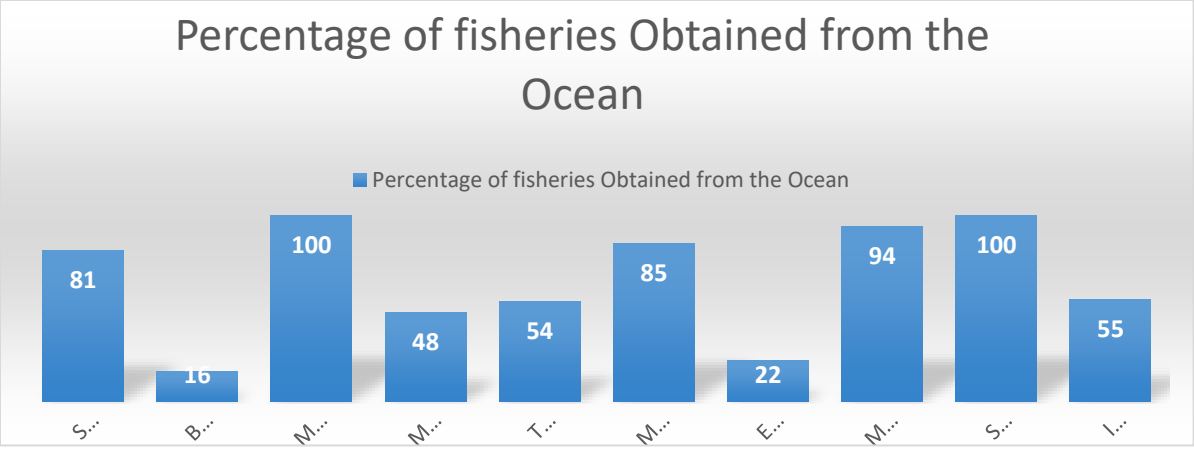
Source: FAO

Figure 2. Average production of Fisheries

Self-Sufficiency among Highly Dependent Countries

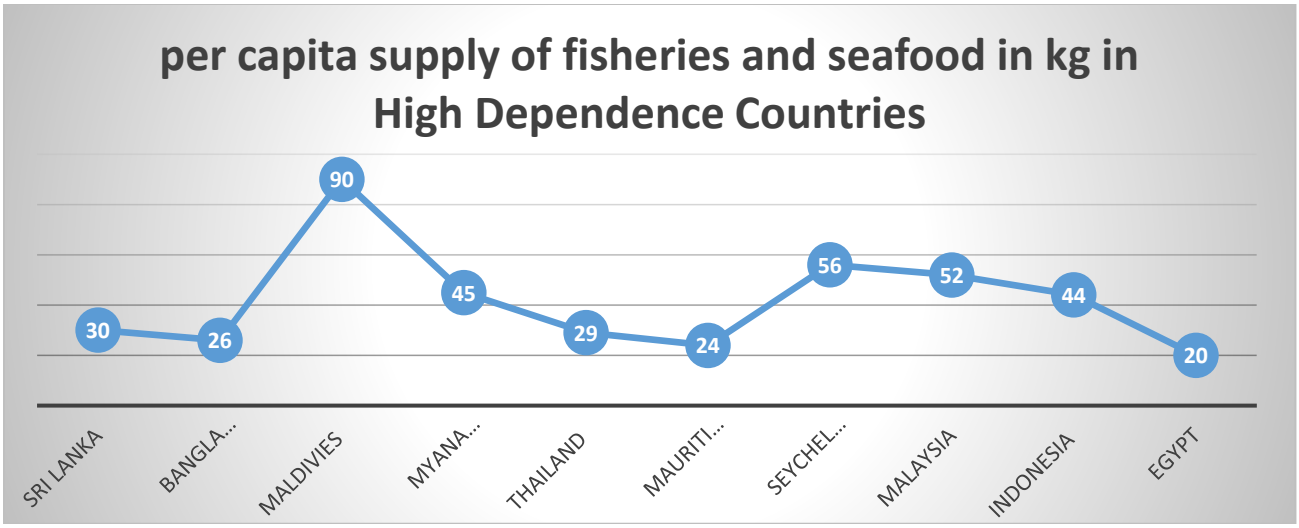
Countries	Self-Sufficiency
Sri Lanka	NO
Bangladesh	NO
Maldives	Yes
Mauritius	Yes
Seychelles	YES
Malaysia	Yes
Indonesia	Yes
Egypt	NO
Myanmar	Yes

Source: FAO 2.1 Table



Source: FAO

figure 2.2 percentage of fisheries obtain from the ocean



Source: FAO

Figure 2.3 per capita supply of fisheries

2.2.2 The Economic Dynamic of Fisheries and Seafood in Highly Dependent countries

The second significant element in the definition of food security is economic access. Without the economic access to fisheries and seafood, a majority of people can't make fisheries and seafood part of their food, thereby economic access plays a fundamental role in ensuring food security. Undertaken research discusses economic access in highly dependent countries.

According to the EIU Food Security Ranking, Sri Lankan food security ranking is 75 out of 113, and its affordability score is 64 out of 100[118]; furthermore, just 4 percent of the population is under the line of poverty,[119]and it is not among LIFDC countries. It comes under the ranking of middle-income countries.

On the EIU food security ranking, Bangladesh stands on 84 out of 113, and its affordability score is 48 out of 100;[120] furthermore, it is among LIFDC countries,[121]and 21 percent population is below

[118] Economist Intelligence Unit, "Sri Lanka Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Sri Lanka.
[119] World Bank, "Poverty Headcount Ratio at National Poverty Lines (% of Population) - Sri Lanka | Data," WORLD BANK, 2016, https://data.worldbank.org/indicator/SI.POV.NAHC?end=2018&locations=LK&start=1960.
[120] Economist Intelligence Unit, "Bangladesh Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Bangladesh.
[121] United Nations Food and Agricuture Organization, "Low-Income Food-Deficit Countries | FAO | Food and Agriculture Organization of the United Nations," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/countryprofiles/lifdc/en/.

the global poverty line[122], and it's the per capita GNI is quite low.[123] Therefore, people can find it difficult to access fisheries and seafood.

The EIU food security ranking and affordability score wasn't available for the Maldives. The Maldives is an upper-middle-income country, and its GNI income is more than 9 thousand US dollars; therefore people can have economic access to fisheries and seafood; [124]nevertheless, its 28 percent population is living below the poverty line, which shows that inequality is prevalent in Maldives.

In the EIU food security ranking, Thailand stands on 51 out of 113 countries, and the affordability score is 81.[125] The per capita GNI is 7260 dollars,[126]and 9 percent of the population lives below the poverty line. According to the EIU food security ranking, Malaysia stands in 43 out of 113 countries; its affordability score is 85.[127] Its per capita GNI is 11230 dollars,[128] and just 3.8 percent of the population is under the global poverty line.[129] It is also not among LIFCD countries.

In EIU food security ranking, Indonesia stands at 65 out of 113 countries, and the affordability score was 73 out of 100.[130] Its per capita GNI was 4450 in 2018;[131] furthermore, its 9.4 percent population lives under the global poverty line.[132] It is not among LIFCD countries.

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[122] World Bank, "Poverty Headcount Ratio at National Poverty Lines (% of Population) - Bangladesh | Data," WORLD BANK, 2019, https://data.worldbank.org/indicator/SI.POV.NAHC?end=2018&locations=BD&start=1960.

[123] World Bank, "GNI per Capita, Atlas Method (Current US$) - Bangladesh | Data," WORLD BANK, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=BD.

[124] world Bank, "GNI per Capita, Atlas Method (Current US$) - Maldives | Data," WORLD BANK, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=MV.

[125] Economist Intelligence Unit, "Thailand Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Thailand.

[126] World Bank, "GNI per Capita, Atlas Method (Current US$) - Thailand | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=TH.

[127] Economist Intelligence Unit, "Malaysia Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Malaysia.

[128] World Bank, "GNI per Capita, Atlas Method (Current US$) - Malaysia | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=MY.

[129] World Bank, "Prevalence of Undernourishment (% of Population) - Malaysia | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=MY.

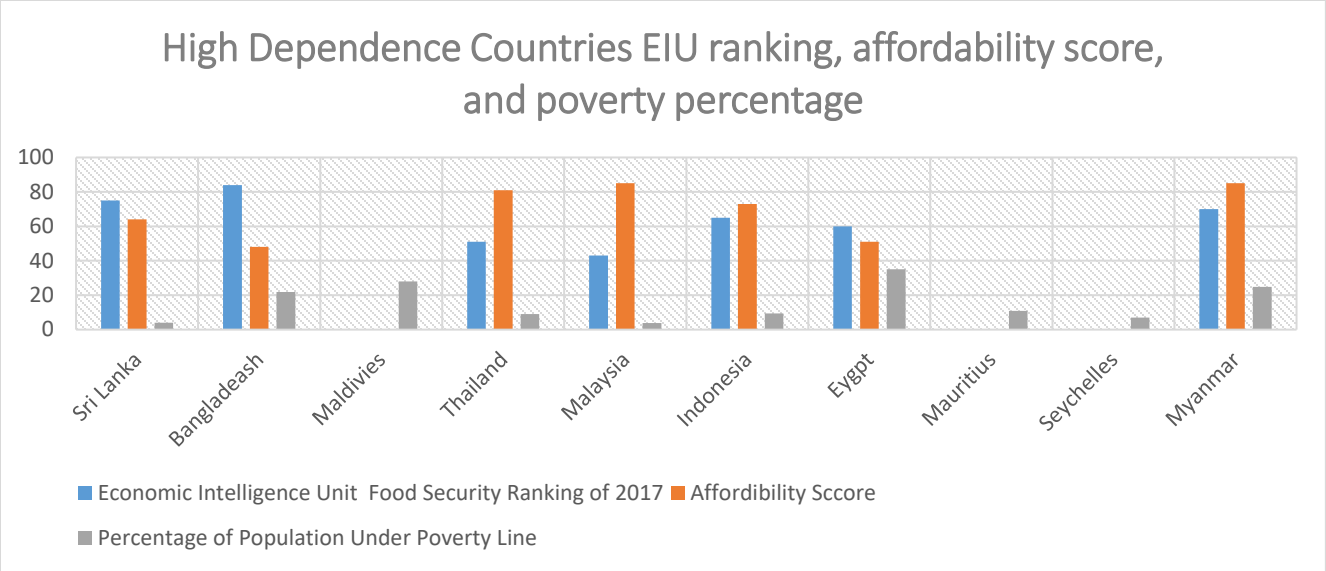
[130] Economist Intelligence Unit, "Indonesia Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Indonesia.

[131] World Bank, "GNI per Capita, Atlas Method (Current US$) - Indonesia | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=ID.

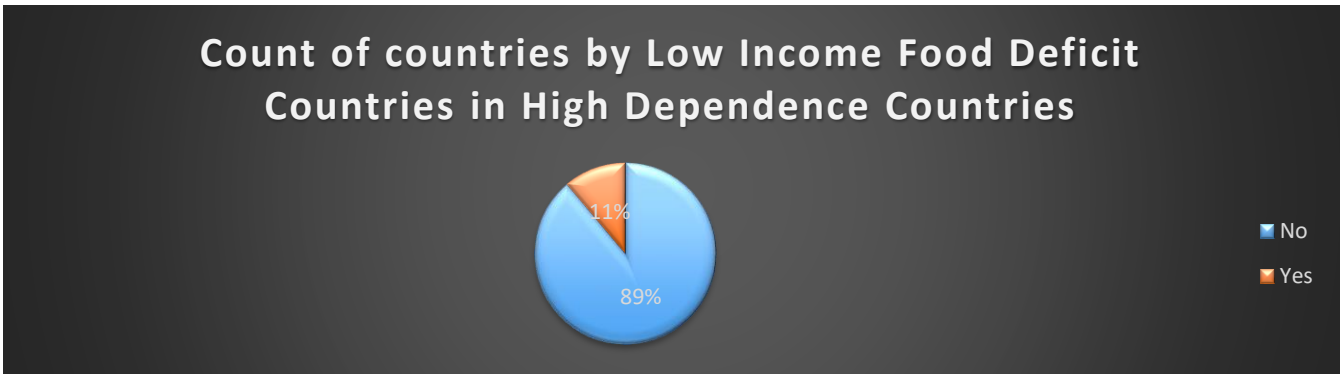
[132] World Bank, "Poverty Headcount Ratio at National Poverty Lines (% of Population) - Indonesia | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SI.POV.NAHC?end=2018&locations=ID&start=1960.

The per capita GNI is 12,900 in Mauritius,[133] and it is not among LIFDC countries. Its ten percent population lives below the global level of poverty.

Seychelles is among high-income countries. The per capita GNI in Seychelles was 16,900 dollars.[134] Its 7 percent population lives below the global line of poverty.[135] It's not among LIFDC countries.



Source: EIU/the World Bank *Figure 2.4*



Source: FAO *Figure 2.5 Number of low income food deficient countries*

[133] world Bank, "GNI per Capita, Atlas Method (Current US$) - Mauritius | Data," Wolrd Bank website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=MU.

[134] world Bank, "GNI per Capita, Atlas Method (Current US$) - Seychelles | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=SC.

[135] world Bank, "Poverty Headcount Ratio at National Poverty Lines (% of Population) - Seychelles | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SI.POV.NAHC?end=2018&locations=SC&start=1960.

On the EIU food security ranking, Myanmar stands on 70 out of 113. Its affordability score is 85;[136] however, its 24 percent population is below the level of poverty,[137] and the per capita GNI is 1390 dollars. It is not among the LIFDC countries.

In Egypt, 32 percent of people live below the poverty line.[138] The GNI per capita in Egypt is 2690.[139] Its ranking in the EIU food security index was 60 out of 113 countries, and its affordability score was 51.[140] Therefore, economic access to fisheries and seafood is difficult. The preference for food is another variable in the definition of food security.

2.2.3 The Preference Dynamic of Food Security

The Preference of people is another important aspect of the food security definition. It shows the consumption of fisheries and seafood in a certain country. It shows the trend in fisheries and seafood consumptions.

In 2010, in Sri Lanka per capita, fish and seafood consumption was 24.14 kg, which jumped to 30 kg in 2017. These statistics are showing that seafood and fisheries are a vital source of food security in Sri Lanka. [141]

Fish and seafood remained preferable food items in Bangladesh. According to the FAO, in 2011, per capita, food consumption in Bangladesh was 19.68 kg, which reached 24.31 kg in 2018.[142] Maldives is an island nation; therefore, fish and seafood remained a preferred food item. The Per capita consumption of fish and seafood is the highest in the world. In 2010, the per capita consumption of fish and seafood was 190 kg, which had declined to just 90 kg in 2017. It was a

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[136] Economist Intelligence Unit, "Myanmar Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Myanmar.

[137] World Bank, "Poverty Headcount Ratio at National Poverty Lines (% of Population) - Myanmar | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SI.POV.NAHC?end=2018&locations=MM&start=1960.

[138] World Bank, "Poverty Headcount Ratio at National Poverty Lines (% of Population) - Egypt, Arab Rep. | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SI.POV.NAHC?end=2018&locations=EG&start=1960.

[139] World Bank, "GNI per Capita, Atlas Method (Current US$) - Egypt, Arab Rep. | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=EG.

[140] Economist Intelligence Unit, "Egypt Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Egypt.

[141] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," Ourworldin Data, 2017, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&country=~LKA&region=Asia.

[142] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," Our world in Data, 2017, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~BGD.

significant decline, but still, consumption is above the recommended level of FAO; nevertheless, people of Maldives exclusively depend on seafood and fisheries for their nutritional needs. Consequently, such a large decline in the consumption of fish and seafood will increase problems of malnutrition in the Maldives.[143]

In 2011, per capita, consumption of fish and seafood was 55 kg in Myanmar, which declined to 45 kg in 2014; however, it witnessed a rise and reached 47 kg in 2018. The per capita consumption of 47 kg is higher than the recommended value of FAO.[144]

In 2011, per capita, consumption of fish and seafood was 24.56 kg in Thailand, which reached 29.27 kg in 2011. The consumption of fisheries increased, while the production of fisheries and seafood was decreased. Thailand was able to meet the demand by importing seafood and fisheries products. [145]

The per capita consumption of seafood and fisheries is very high in Malaysia. In 2011, the per capita consumption was 56.11 kg, which reached 60 kg in 2012, then it witnessed a decline and reached 57.62kg in 2018, which was higher than 56 kg in 2011. The per capita consumption of 56 kg is higher than the average per capita consumption of the world. It shows that fisheries and seafood are preferable food items in Malaysia and an irreplaceable component of food security, because Malaysians rely on fisheries and seafood for their nutritional needs.[146]

The consumption of fish and seafood is very high in Indonesia. In 2011, the per capita consumption of fish and seafood was 28.78 kg, which had reached 44.67kg in 2018. In the past 7 years, per capita consumption increased by 16 kg. It shows that fish and seafood are preferred food items

[143] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," Our world in Data, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~MDV.

[144] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," United Nations Food and Agriculture Organization, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~MMR.

[145] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," United Nations Food and Agriculture Organization, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~THA.

[146] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," Our world in Data, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~MYS.

Indonesia. It is also an important element of food security in Indonesia, because it is a vital source of nutritional security in Indonesia. [147]

The per capita consumption of fisheries and seafood is high in Mauritius. In 2011, the per capita consumption of fish and seafood was 22.18 kg, which reached 23.07 kg in 2018. The per capita consumption of 23 kg is higher than the world average consumption of fish and seafood.[148] Hence, seafood and fisheries are preferable food items in Mauritius.

The per capita consumption of fisheries and seafood remained high in Seychelles. In 2017, the per capita consumption of fisheries and seafood was 56 kg. The per capita consumption of 56 kg is higher than the WHO recommended value, and it is also higher than the average per capita consumption of the world, but Seychelles gets a big partition of its animal protein from fisheries and seafood; therefore, a small change in the consumption of fisheries and seafood can impact nutritional security in Seychelles.

2.2.4 The Nutritional Dynamic of Highly Dependent Countries:

The FAO definition of food security talks about the importance of nutrition in human diet. Undertaken research below discusses the role of fisheries and seafood in providing nutrition such as protein. Undertaken research discusses the country role of nutrition in highly dependent countries.

People in Seychelles get 49 percent of animal protein from fisheries and seafood[149]. It is not among LIFDC countries; furthermore, its data of GHI and WWF fisheries dependence index was not available.

In Egypt, people get their 28 percent animal protein from fisheries and seafood, while the share of protein in the total consumption of protein is 7 percent.[150] It is among the countries where the

[147] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," Our world in Data, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~IDN.

[148] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," United Nations Food and Agriculture Organization, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~MUS.

[149] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[150] Organization.

consumption of fisheries and seafood is high. According to GHI, the level of hunger in Egypt is moderate, [151]and its 5 percent population is facing the problem of undernourishment. [152]

It means that little change in the consumption pattern of fish and seafood can put people at risk of malnutrition. The production of fish and seafood is continuously declining. Malaysia meets 30 percent of fisheries and seafood demand through the import of fisheries and seafood. It means that Malaysia is relying on imports to meet the demand. It can impact its food security chain in the future. Malaysians get their 38 percent of animal protein from fisheries and seafood,[153] and just 3 percent of the population is undernourished;[154] Furthermore, its GHI score is moderate.[155]

People in Thailand get their 40 percent of animal protein from fisheries and seafood[156]— and 9 percent population is facing the problem of undernourishment[157]; furthermore, according to the GHI— the situation is moderate in Thailand. According to the WWF fisheries dependence index— its dependence on fisheries and seafood is high. [158] In Thailand, the problem of malnutrition is decreasing. Stunted growth and underweight children witnessed a 10 percent decline, but obesity has taken over the place of malnutrition. The increasing consumption of fisheries and seafood can overcome the problem of obesity as well.

According to the FAO, Indonesians are getting more than 62 percent of their protein from fish and seafood.[159] It means Fish and seafood are a crucial source of nutritional security in Indonesia. Its 9 percent population is facing the problem of undernourishment.[160] According to the GHI— the

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[151] Global Hunger Index, "Egypt - Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels," Global Hunger Index, 2019, https://www.globalhungerindex.org/egypt.html.

[152] World Bank, "Prevalence of Undernourishment (% of Population) - Egypt, Arab Rep. | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=EG.

[153] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[154] Bank, "Prevalence of Undernourishment (% of Population) - Malaysia | Data."

[155] Global Hunger Index, "Malaysia - Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels" (Kuala Lumpur, 2019), https://www.globalhungerindex.org/malaysia.html.

[156] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[157] World Bank, "Prevalence of Undernourishment (% of Population) - Thailand | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=TH.

[158] Global Hunger Index, "Thailand - Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels" (London, 2019), https://www.globalhungerindex.org/thailand.html.

[159] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[160] World Bank, "Prevalence of Undernourishment (% of Population) - Indonesia | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=ID.

situation is moderate in Indonesia.[161][162] Fish and seafood are not only providing protein but also an important source of other micronutrients, which help in children's growth and provide protection against a wide range of health issues. Lack of protein-rich food also increases the rate of stunted growth among children. Provinces in Indonesia where consumption of fish and seafood is low, stunted children are 48 percent more than other provinces, where consumption of fish and seafood is high. All these statistics are showing that fish and seafood are a vital source of food security in Indonesia.

People get 19 percent of animal protein from fisheries and seafood in Mauritius.[163] It is not a food deficit country, and according to the Global Hunger Index, the level of hunger is moderate. Its 5 percent population is undernourished.[164]

The food security definition also points out the centrality of nutrients in food. People should have food full of essential nutrients. Although in Sri Lanka, the per capita consumption of fish and seafood is higher than the WHO recommended level, the people of Sri Lanka get 52 percent of animal protein from fish and seafood.[165] According to the WWF, its dependence on fisheries and seafood is high.[166] According to the GHI, the level of hunger is moderate — and its 7 percent population undernourished.[167] People in Bangladesh get 60 percent of animal protein from fisheries and seafood.[168] According to GHI, the level of hunger in Bangladesh is serious.[169] Its 13 percent population is undernourished.[170]

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[161] Global Hunger Index, "Indonesia - Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels" (Jakarta, 2019), https://www.globalhungerindex.org/indonesia.html.

[162] Martin Quaas et al., "Fishing for Proteins," *Wwf Germany* (Hamburg, 2016).

[163] world Bank, "Prevalence of Undernourishment (% of Population) - Mauritius | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=MU.

[164] Bank.

[165] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[166] Quaas et al., "Fishing for Proteins."

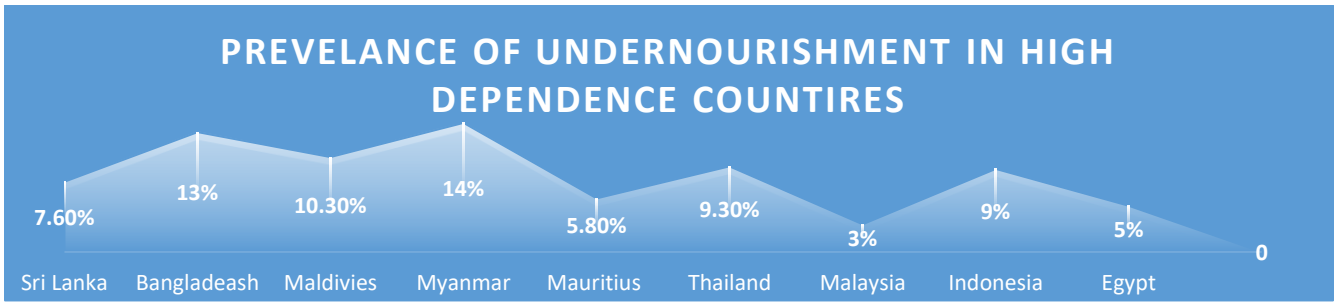
[167] World Bank, "Prevalence of Undernourishment (% of Population) - Sri Lanka | Data," WORLD BANK, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=LK.

[168] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[169] Global Hunger Index, "Bangladesh - Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels," *Global Hunger Index* (Dahka, 2019), https://www.globalhungerindex.org/bangladesh.html.

[170] world Bank, "Prevalence of Undernourishment (% of Population) - Bangladesh | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=BD.

People in the Maldives get their 60 percent of animal protein from fisheries and seafood, and[171] its 10.3 percent population is undernourished. [172]



Source: The World Bank *Figure 2.6 percentage of undernourished population*

2.3 The Dynamics of Food Security in Medium High Dependence Countries

Undertaken research divides countries in four groups. In medium high dependence groups those countries are placed that according to the WWF, rely on fisheries and seafood resource a lot. These countries are medium high dependent on fisheries and seafood resources. Undertaken research describes here the production dynamic of fisheries and seafood. It also study physical access of people to fisheries and seafood. Without Physical access, fisheries and seafood cannot become part of food security. Then it describes the economic dynamics. After it, describes dynamic of preference, and nutritional dynamic.

2.3.1 The Dynamics of Production:

The food security definition of FAO talks about the physical access to food. To maintain physical access production of food is very important. Undertaken research is about the IO, so it calculates the percentage of fisheries and seafood obtained from the Ocean; furthermore, it discusses per capita supply and dynamics of exports and imports to calculate self-sufficiency using the FAO formula. Besides, it also finds out that whether a country is among category of Low Income Food Deficient countries.

In 2011, the total production of fisheries and seafood was 361366 tonnes in Tanzania, which reached 392007 tonnes in 2018. In 2011, the contribution of capture production was 345117 tonnes, which reached 375155 tonnes in 2018, while the contribution of aquaculture production was 7249 tonnes in 2011, which reached 16852 tonnes in 2018. The total average production in the past 8 years was 817,275, and the share of capture production was 98 percent.

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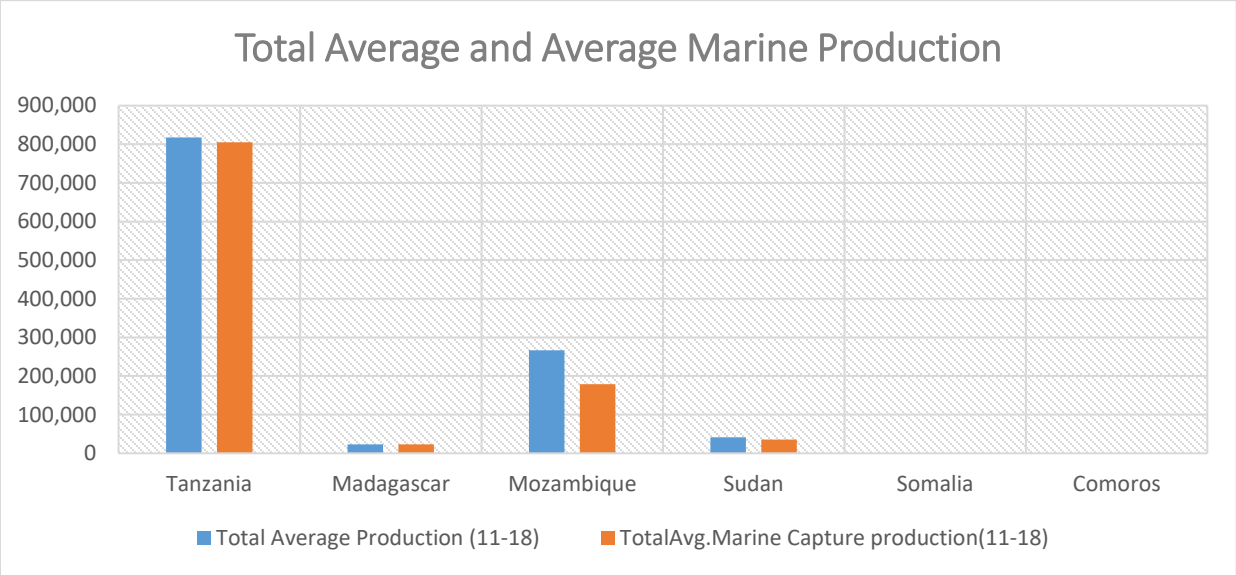
[171] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[172] world Bank, "Prevalence of Undernourishment (% of Population) - Maldives | Data," WORLD BANK website, 2107, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=MV.

In 2018, it exported 206 million dollars' worth of fisheries and seafood products, while in the same year, it imported 104 million dollars' worth of fisheries and seafood products. The value of exports is greater than the value of imports that's why it has physical access to fisheries and seafood. However, the per capita supply of fisheries and seafood is 7 kg which is not a high value.[173] After describing the Production dynamic in Tanzania, the Undertaken research discusses the production dynamics in Madagascar.



Source: FAO

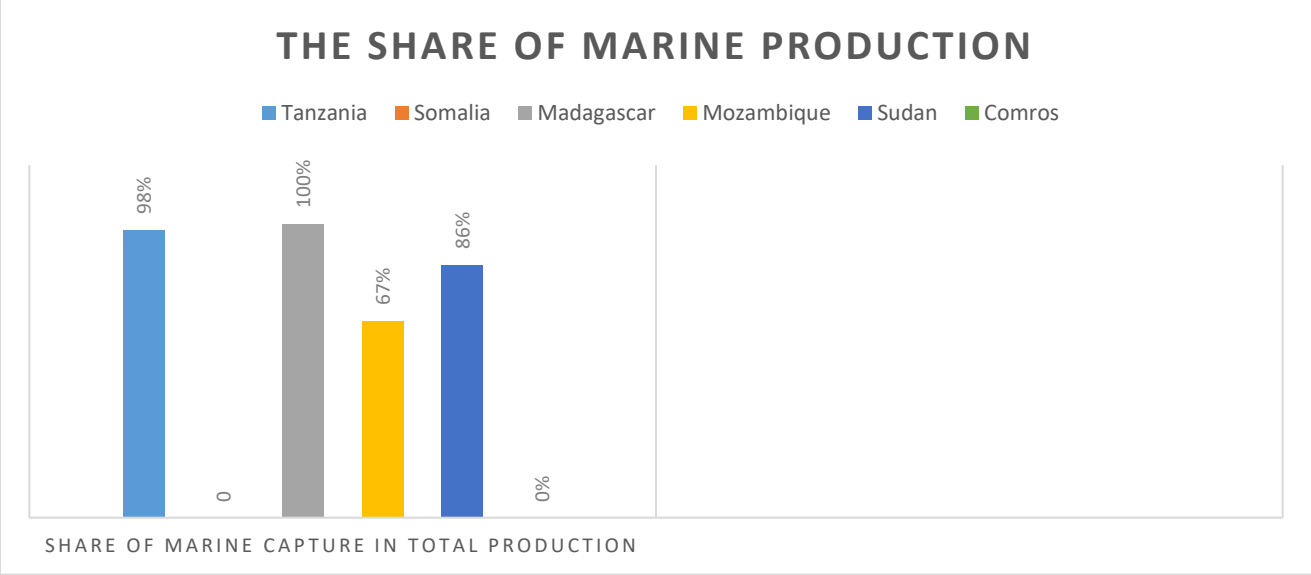
Figure 2.7. Production dynamics

The total average production of fisheries and seafood in the past eight years was 23,306 tonnes in Madagascar, and the share of marine captured fisheries and seafood was 100 percent in Madagascar. It exports a huge chunk of fish and seafood to China, the EU, and the US; furthermore, it contributes 7 percent to the GDP. Hence, its export of fish and seafood is greater than its imports; therefore, Madagascar has no issue of physical access to fish and seafood. However, the level of poverty is very high in Madagascar, which means that the export of fisheries can happen for more income even when people don't have physical access to them. After Madagascar, the undertaken research discusses Comoros.

In 2011, the total production of fish and seafood was 38180 tonnes in Comoros, which declined to 13089 tonnes in 2018. The total production of fish and seafood was obtained from the Indian Ocean. The total average production in the past 8 years was not available. The share of marine

[173] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

capture was also not available. The value of its import is greater than the value of its exports; therefore, it is not self-sufficient in the production of fisheries and seafood.[174] After Comoros, the undertaken research discusses Somalia.



Source: Calculated using FAO Data. *Figure 2.8 Percentage of marine capture*

According to estimates of FAO, the production of fish and seafood is around 30000 MT in Somalia. The Data related to the imports and exports was not available; therefore, the measurement of self -sufficiency index is not possible. The second element in the definition of food security is economic access to food. After Somalia, Mozambique is another country that comes in Medium High dependent countries.

The production of fish and seafood is increasing in Mozambique. In 2011, the total production of fish and seafood was 195,280 tonnes, which reached 328,276 tonnes in 2018. Out of the total production, the contribution of marine capture was 121,856 in 2011, which reached 231,256 in 2018, whereas the contribution of inland capture was 73424 tonnes in 2011, which reached 97020 in 2018. Its total average production in the past 8 years was 266,622, while the contribution of marine capture was 67 percent as shown in figure 2.8.

In 2011, Mozambique exported 58 million dollars' worth of seafood and fisheries products, and in 2018, it exported 78 million dollars' worth of fish and seafood products, whereas, in the same

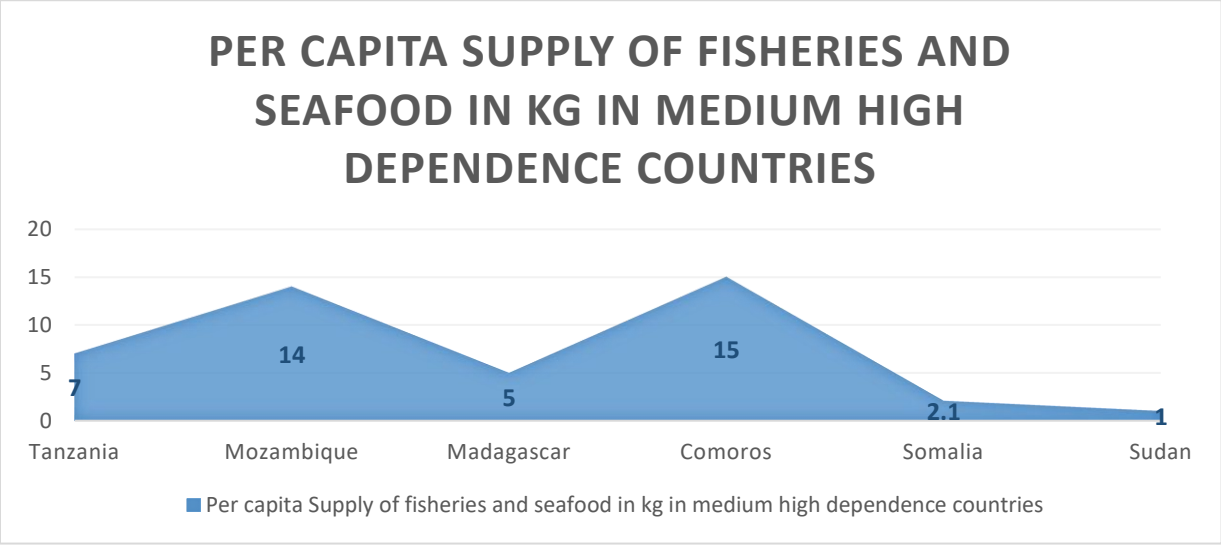
[174] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Union of the Comoros," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/fishery/facp/COM/en.

period, it imported 58262 million dollars and 78 868 million dollars' worth of fisheries and seafood products. The value of its imports is greater than it's the value of exports that is why it is not self-sufficient in the production of fisheries and seafood.[175] After Mozambique, Undertaken research discusses Sudan.

Self-sufficiency in Fisheries resources Medium High Dependent Countries

Country	Self Sufficiency
Tanzania	Yes
Mozambique	NO
Madagascar	Yes
Somalia	No
Sudan	NO
Comoros	No

Source: FAO *2. 2 Table. Self-sufficiency in Production*



Source: FAO *Figure 2.9 Per capita supply*

[175] United Nations Food and Agriculture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Republic of Mozambique," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/fishery/facp/MOZ/en.

In 2012, total capture production was 34000 tonnes, which reached 41041 tonnes in 2018. In 2012 the production of aquaculture was 7500 tonnes, which reached 10000 tonnes in 2018. In the past 7 years, the total average production was 41,161 tonnes. The share of marine captured production was 86 percent. The value of imports is greater than the value of its exports; therefore, it is not self-sufficient in the production of fisheries and seafood. The per capita of fisheries and seafood supply in Sudan is 1 kg.[176]

2.3.2 The Economic Dynamic of Food Security:

The second aspect in the definition of food security is economic access to fisheries and seafood. Without the economic access, physical access to food for the majority of population is not possible. Undertaken research discusses the economic dynamic of food security in these countries separately.

In terms of per capita income, Tanzania is among the 15 poorest nations in the world. The gross per capita GNI is just 1080 dollars,[177]and it is also ranked among low-income-food deficit countries; furthermore, 14 million people live below the poverty line.[178] Therefore, people don't have access to fisheries and seafood. In the EIU food security ranking, its overall ranking is 89 out of 113, and affordability score is 41. [179]

Somalia is the poorest country in the world. The per capita GNI in Somalia was 130 US dollars.[180] Its 69 percent of the population is living below the poverty line. It is among LIFDC countries. Madagascar is among the poorest countries in the world. The GNI per capita is just 520 US dollars.[181] In the EIU ranking, its ranking was 108 out of 113 countries, and its affordability score

[176] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[177] World Bank, "GNI per Capita, Atlas Method (Current US$) - Tanzania | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=TZ.

[178] World Bank, "Poverty Headcount Ratio at National Poverty Lines (% of Population) - Tanzania | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SI.POV.NAHC?end=2018&locations=TZ&start=1960.

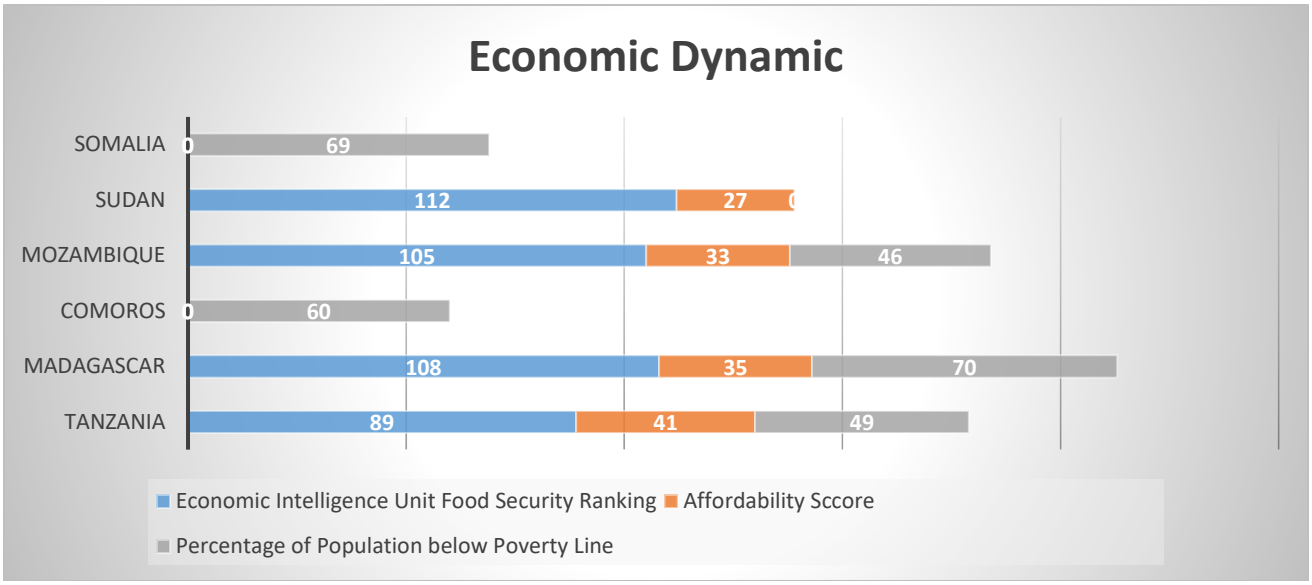
[179] Economist Intelligence Unit, "Tanzania Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Tanzania.

[180] World Bank, "GNI per Capita, Atlas Method (Current US$) - Somalia | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=SO.

[181] world Bank, "GNI per Capita, Atlas Method (Current US$) - Madagascar | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=MG.

is just 35 out of 100.[182] Its 70 percent population lives below the global poverty line.[183] It is among LIFDC.

Comoros is among the poorest and least developed nations in East Africa. Its 60 percent population is below the line of poverty[184]. It is among LIFDC countries. It's ranking of the EIU food security index and affordability score wasn't available.

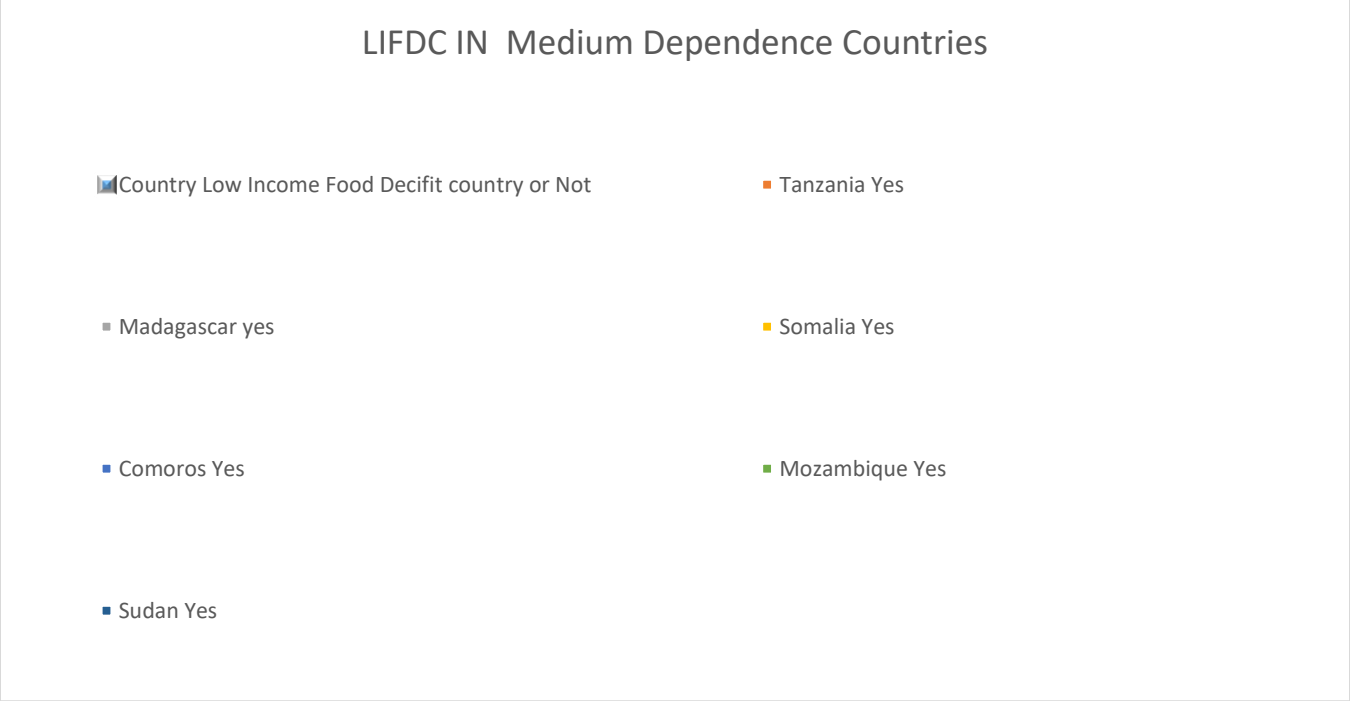


Source: World Bank/EIU *Figure 2.10. Economic dynamic*

Mozambique is one of the poorest countries in the world. The per capita GNI was 490 in Mozambique in 2019.[185] According to the EIU Food Security Index, its ranking was 105 out of 113 countries in 2018, and in the affordability category, its score is 33,[186] which is very low, and 46 percent of the population is under the global poverty level. [187]

[182] Economist Intelligence Unit, "Madagascar Food Security," Economist Intelligence Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Madagascar.
[183] world Bank, "Poverty Headcount Ratio at National Poverty Lines (% of Population) - Madagascar | Data," WORLD BANK Website, 2019, https://data.worldbank.org/indicator/SI.POV.NAHC?end=2018&locations=MG&start=1960.
[184] world Bank, "Poverty Headcount Ratio at National Poverty Lines (% of Population) - Comoros | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SI.POV.NAHC?end=2018&locations=KM&start=1960.
[185] world Bank, "GNI per Capita, Atlas Method (Current US$) - Mozambique | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=MZ.
[186] Economist Intelligence Unit, "Mozambique Food Security," Economist Intelligence Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Mozambique.
[187] world bank, "Poverty Headcount Ratio at National Poverty Lines (% of Population) - Mozambique | Data," Wolrd Bank website, 2019, https://data.worldbank.org/indicator/SI.POV.NAHC?end=2018&locations=MZ&start=1960.

In the EIU food security ranking, it was placed in 112 out of 113 countries in Sudan, and its affordability ranking was 27 out of 100.[188] Its per capita GNI is 590 US dollars.[189] It is among LIFDC countries.



Source: FAO *Figure 2.11.LIFDC countries*

2.3.4 The preference Dynamic:

The preference for food is another variable in the definition of food security. It tells about the people's preference of a certain food item whether people want to eat it or not. It is a component of food security definition given by the FAO. Without preference for a certain food item, it cannot become part of the food security, because people don't like to eat.

In Sudan, in 2012, the per capita consumption of fisheries and seafood was 0.97 kg, and the per capita consumption was 1.1 kg in 2017. [190]

The statistics related to per capita consumption are also not available in Somalia.

[188] Economist Intelligence Unit, "Sudan Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Sudan.

[189] World Bank, "GNI per Capita, Atlas Method (Current US$) - Sudan | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=SD.

[190] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 2012 to 2017," United Nations Food and Agriculture Organization, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~SDN.

Comoros is an island nation; therefore, the consumption of fish and seafood is very high in Comoros. In 2014, the per capita consumption of fisheries was 29 kg, which is higher than the recommended value of the WHO.

The Per capita consumption of fisheries and seafood is low in Tanzania. In 2011, the per capita consumption of fisheries and seafood was just 5 kg, which reached 6.80 kg in 2018. The per capita consumption of fisheries and seafood remained low from the WHO recommendation as well as from average per capita consumption of the world. [191]

In 2011, in Mozambique, the per capita consumption of fish and seafood was 8.47 kg, which reached 11.46 kg in 2018. The per capita consumption of 11 kg is according to the recommendation of WHO, but it is less than the average consumption of the world. In the past 9 years, it witnessed a 9 kg increase in the consumption of fisheries and seafood. The fourth element in the definition of food security is nutritional security. [192]

2.3.5 The Nutritional Dynamic:

The nutritional dynamics tells about the importance of a certain food item in providing nutritional security to people of a country. In case of fisheries and seafood, the role of fisheries and seafood in providing protein and other nutrients. It also tells about the level of hunger and the percentage of population that is undernourished.

The situation of food security is worrisome in Mozambique. According to the World Hunger Index, the level of hunger is alarming in Mozambique.[193] According to the WWF, its dependence on fisheries and seafood for protein is medium-high,[194] and it gets 39 percent of animal protein from fisheries and seafood.[195]Its 30.5 percent of the population is facing the problem of undernourishment. [196]

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[191] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," United Nations Food and Agriculture Organization, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~TZA.

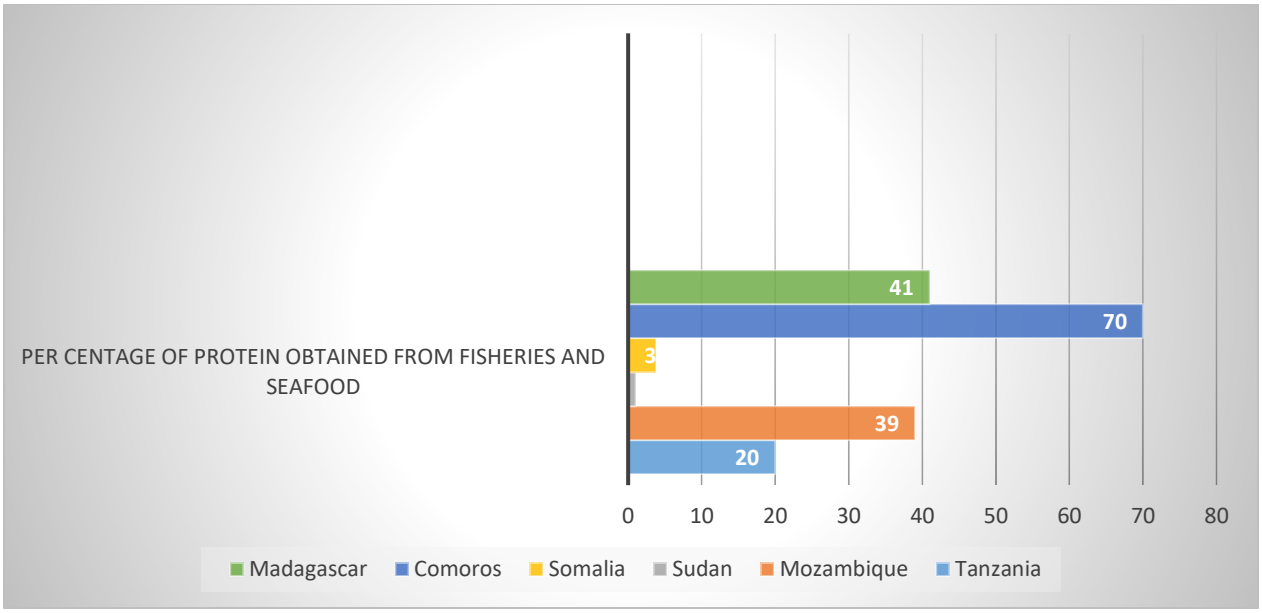
[192] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," United Nations Food and Agriculture Organization, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~MOZ.

[193] Global Hunger Index, "Mozambique - Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels," Global Hunger Index, 2019, https://www.globalhungerindex.org/mozambique.html.

[194] Quaas et al., "Fishing for Proteins."

[195] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[196] World Bank, "Prevalence of Undernourishment (% of Population) - Mozambique | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=MZ.



Source: FAO year book

Figure 2.12. Percentage of fisheries obtained from fisheries

The situation of nutritional security is the worst in Somalia. According to the Hunger Index, the food security situation in Somalia is alarming.[197] People get 3.8 percent protein from fisheries from seafood. [198]

Comoros highly rely on fish and seafood for their nutritional needs. It gets more than 70 percent of its protein from fish and seafood.[199] According to the World Hunger Index, the situation of hunger is alarming in Comoros. Consequently, Comoros highly relies on fish and seafood for food security. [200]

In Tanzania, people get 24 percent of animal protein from fisheries and seafood and 3 percent of overall protein from fisheries and seafood.[201]. According to FAO, 25 percent of the population is facing the problem of undernourishment.[202] According to GHI, the level of hunger in Tanzania is

[197] Global Hunger Index, "Somalia - Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels," Global Hunger Index, 2019, https://www.globalhungerindex.org/somalia.html.

[198] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

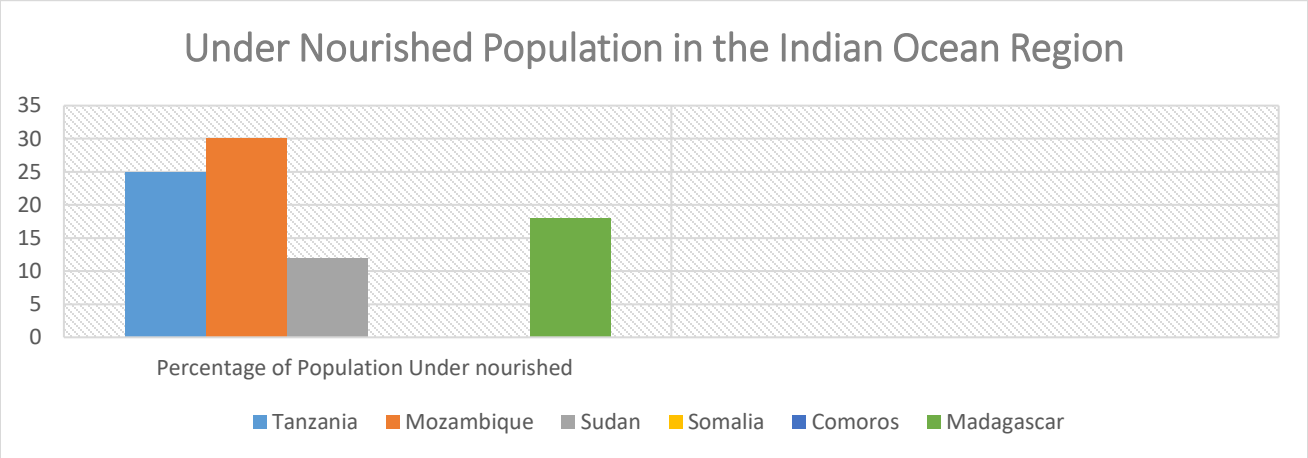
[199] Organization.

[200] Quaas et al., "Fishing for Proteins."

[201] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[202] World Bank, "Prevalence of Undernourishment (% of Population) - Tanzania | Data," Wolrd Bank website, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=TZ.

alarming.



Source: World Bank *Figure 2.13*

Sudan gets 1 percent of animal protein from fisheries and seafood.[203] According to GHI, the level of hunger in Sudan is alarming. [204]Its 12.4 percent of the population is facing the problem of undernourishment. [205]

Madagascar gets 18 percent of animal protein from fish and seafood.[206] Its 41 percent population is facing undernourishment,[207] and according to GHI, the level of hunger is alarming in Madagascar.

2.4 Food Security Dynamics in Medium Dependence Countries:

Undertaken research divides countries in four groups. In medium dependence groups those countries are placed that according to the WWF, rely on fisheries and seafood resource to a sufficient level. These countries are medium dependent on fisheries and seafood resources. Undertaken research describes here the production dynamic of fisheries and seafood. It also study physical access of people to fisheries and seafood. Without Physical access, fisheries and seafood cannot become part of food security, then it describes the economic dynamics. After it, describes dynamic of preference, and nutritional dynamic.

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[203] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[204] Global Hunger Index, "Sudan - Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels," Global Hunger Index, 2019, https://www.globalhungerindex.org/sudan.html.

[205] World Bank, "Prevalence of Undernourishment (% of Population) - Sudan | Data," Wolrd Bank website, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=SD.

[206] Quaas et al., "Fishing for Proteins."

[207] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

2.4.1 The Production Dynamic:

To Ensure Physical access of people to food, it is rudimentary that a country has enough production of food. It is the first element of the food security definition. Undertaken research below describes the different aspect of fisheries production in Medium Dependence countries to know about the physical access to fisheries and seafood.

In 2011, captured fish and seafood contribution was 454473 tonnes in Pakistan, while in 2018, its contribution was 504810 tonnes. The Marine captured fisheries contribution is greater than inland and aquaculture. In the past eight years, the contribution of marine capture in the total production was 63 percent. In 2018, the contribution of fish and seafood in the export was around 451 million dollars. Fish and seafood exports witnessed an increase of 14 percent in 2018. The value of exports is greater than the value of imports, so it is self-sufficient in the production of fisheries and seafood; however, per capita supply is very low. It means that Pakistan is using its fisheries and seafood production for non-food uses and also exporting a large part of its production. [208] After Pakistan, undertaken research discusses India.

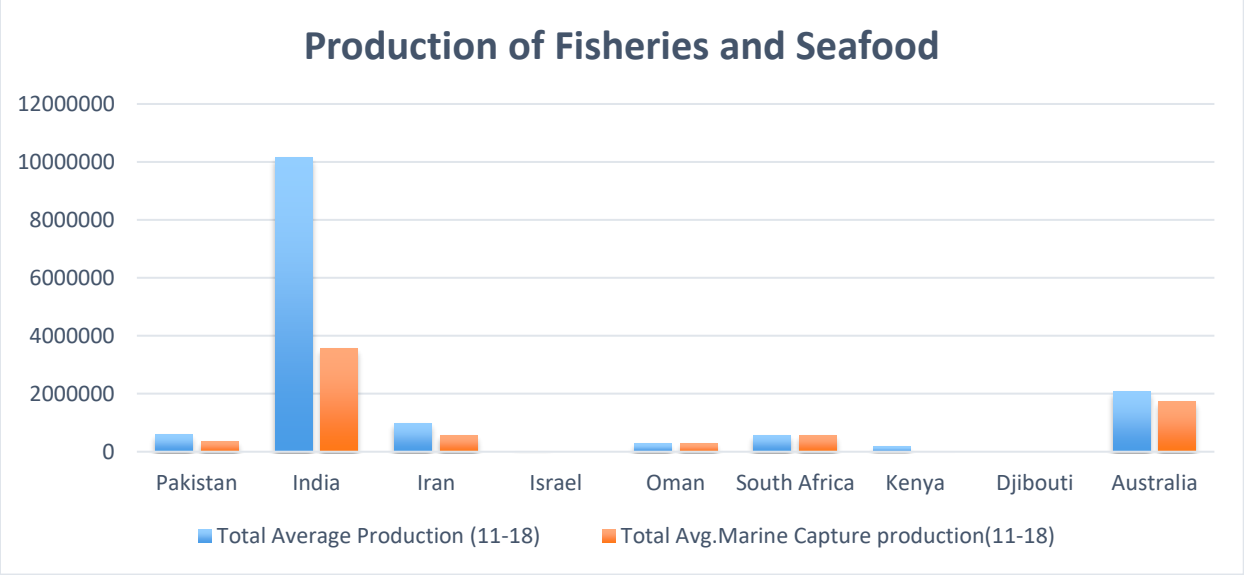
The total average production of fisheries and seafood in the past 8 years was 10,150,925 tonnes in India. The share of marine capture was 35 percent. The per capita supply was 6.9 kg.[209] In 2017, India exported seafood and fisheries worth 7 billion dollars. In 2011, the contribution of captured seafood and fisheries was around 4.3 million tonnes, which gradually increased 5.3 million tonnes in 2018. The value of exports is greater than the value of imports; therefore, it is self-sufficient in the production of fisheries and seafood. After India, the Undertaken research discusses South Africa.

In 2011, the total production of fish and seafood was 537,366 tonnes in South Africa, which reached 565,917 tonnes in 2018. The contribution of capture fish and seafood was 534,023 tonnes in 2011, which reached 559,736 tonnes in 2018, whereas the contribution of aquaculture was 3343 tonnes in 2011, which increased to 6181 tonnes in 2018. Out of total capture production, the contribution of marine capture was 533,123 tonnes in 2011, which reached 558,836 tonnes in 2018,

[208] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Islamic Republic of Pakistan," United Nations Food and Agriculture Organization, 2017, http://www.fao.org/fishery/facp/PAK/en.

[209] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Republic of India," United Nations Food and Agriculture Organization, 2017, http://www.fao.org/fishery/facp/IND/en.

while the contribution of inland capture was 900 tonnes in 2011, which remained the same in 2018. The total average production in the past 8 years was 569,000, and the share of marine capture was 563,102.



Source: FAO

Figure 2.14 Production Dynamic

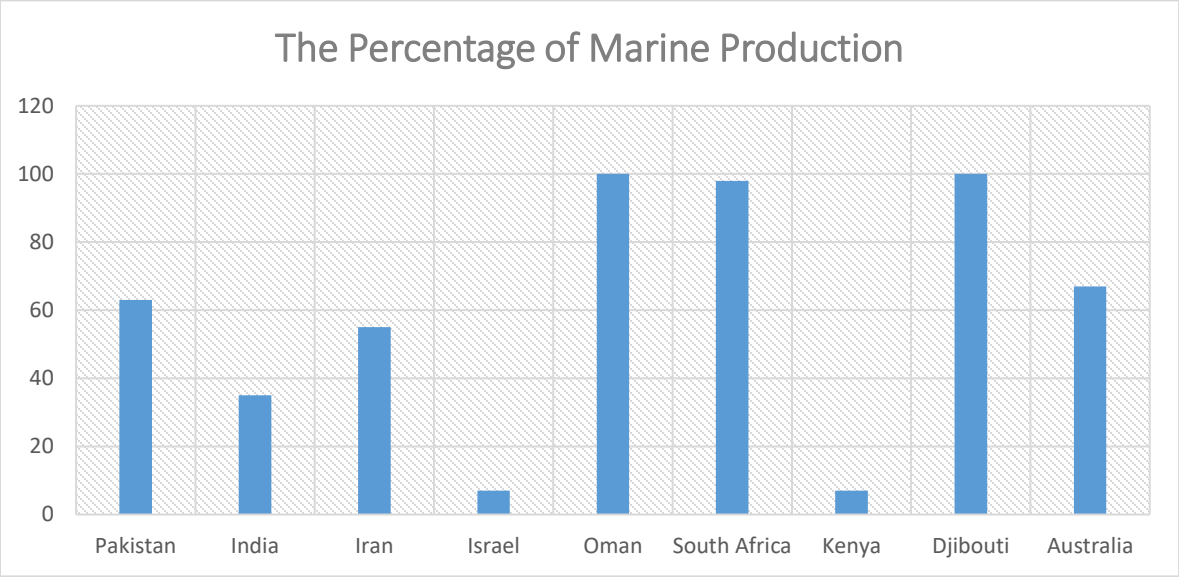
[210] In 2011, it exported 599 million dollars' worth of fish and seafood products, and in 2018, it exported 713 million dollars' worth of fish and seafood products, while in the same years, it imported 270 million dollars and 505 million dollars' worth of fish and seafood products respectively. It imports a large portion of fish and seafood for human consumption. The value of its exports is greater than the value of its import; therefore, it is a self-sufficient country in the production of fisheries and seafood. [211] After South Africa, the undertaken research discusses Oman.

In 2011, the contribution of captured fish and seafood was 158566 tonnes in Oman, which reached 553545 tonnes in 2018. The total average capture production in the past 8 year was 275870 tonnes, and the total production came from marine capture. The value of its exports is greater than the

[210] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Republic of South Africa," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/fishery/facp/ZAF/en.

[211] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

value of its imports; therefore it is self-sufficient in the production of fisheries and seafood. The per capita supply in Oman was 28 kg in 2017. [212] After Oman, undertaken research discusses Iran.



Source: Calculated from FAO Data *Figure 2.15 the percentage of Production*

Self-sufficient in Production

Country	Self-Sufficiency in the Production
Pakistan	Yes
India	Yes
Iran	Yes
Israel	No
Oman	Yes
South Africa	Yes
Kenya	No
Djibouti	No
Australia	No

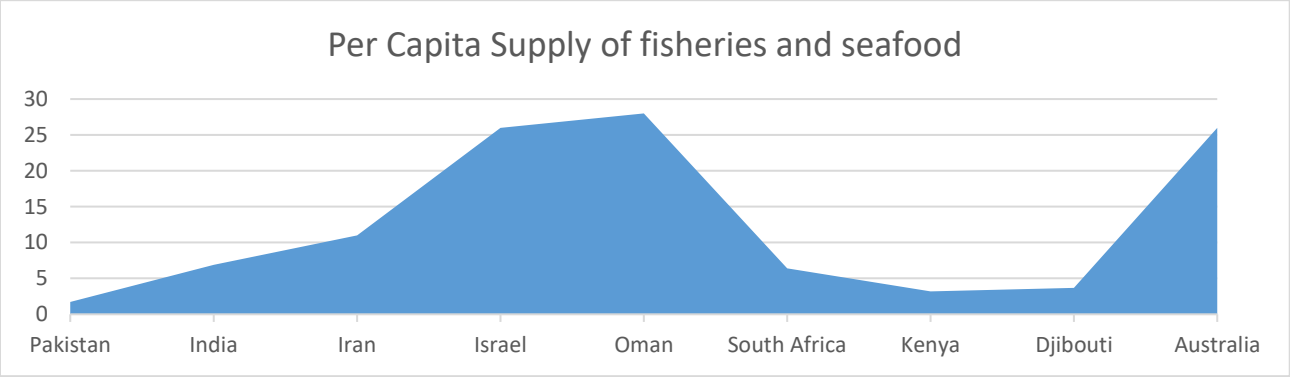
Source: FAO *2.3 Table*

The production of fish and seafood is increasing in Iran. In 2011, the contribution of captured fish and seafood was 487683 tonnes, which reached 828872 tonnes in 2018, whereas the contribution of marine capture was 411413 tonnes in 2011, which was 723248 tonnes in 2018. It means that the production of marine capture is increasing in Iran; furthermore, the production of inland capture is also increasing. In 2011, the production of inland capture was 75920 tonnes, which

[212] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - National Aquaculture Sector Overview - Oman," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/fishery/countrysector/naso_oman/en.

reached 105624 tonnes in 2018. In the past 8 years, the average total production was 989,678 tonnes, while the average marine captured production of fisheries and seafood was 551,192 tonnes; the share of marine capture fisheries and seafood was 55 percent. [213]

The value of its exports is greater than the value of its imports; therefore, it is self-sufficient in the production of fisheries and seafood. The per capita supply in 2017 was 11 kg. After Iran, undertaken research discusses Israel.



Source: FAO

Figure 2.16 Per capita supply

In 2011, the contribution of fish and seafood was 22000 tonnes in Israel, which declined to 17000 tonnes in 2018. Aquaculture played a great role in the total production of fish and seafood. In 2011, the contribution of aquaculture in the total production was 20 thousand tonnes, and in 2018, the contribution of aquaculture was 17 thousand tonnes, whereas the contribution of capture fish and seafood was 2575 tonnes in 2011, which declined to 2054 tonnes in 2018. In total capture production, the contribution of marine capture was 2113 tonnes in 2011, and in 2018, it was 1122 tonnes. It shows a 50 percent decline in marine capture fisheries; therefore, Israel is importing more fish and seafood products to meet the domestic demand. In 2011, it imported 386 million dollars' worth of fish and seafood products, which has increased to 664 million in 2018. Israel is ensuring people's physical access by importing fish and seafood. After Israel, the undertaken research discusses Australia.

In 2011, the contribution of captured fish and seafood was 0.183 million tonnes in Australia, which reached 0.184 million tonnes in 2018. The contribution of marine capture was 0.182 million tonnes in 2011, which reached 0.184 million tonnes in 2018. In the last few years, Australia is importing

[213] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Islamic Republic of Iran," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/fishery/facp/IRN/en.

more fish and seafood products to meet the growing demand for fish and seafood. The total production in the past 8 years was 2,067,772 tonnes, and the contribution of marine capture was 174,259 tonnes; it obtained 67 percent of fisheries and seafood from the sea.[214] The value of its imports is greater than the value of its imports; therefore, it is not self-sufficient in the production of fisheries and seafood. The per capita supply was 26 Kg. After this, the undertaken research discusses Kenya.

In recent years, the production of captured fish and seafood and aquaculture is declining in Kenya. In 2011, the total production of fisheries and aquaculture was 203,402 tonnes, which declined to 137,929 million tonnes in 2018. In 2011, the contribution of capture fish and seafood was 181,267 tonnes, which declined to 122,805 tonnes in 2018, while the contribution of aquaculture was 22,135 tonnes in 2011, which declined 15,124 tonnes in 2018. Out of the total capture production, the contribution of inland fish and seafood was 174,356 tonnes in 2011, which declined to 98000 tonnes in 2018, whereas in the same years, the contribution of marine capture was 6911 tonnes and 24805 tonnes respectively.

In the past 8 years the total average production was 171,974 tonnes, and the share of marine captured fisheries and seafood was 7 percent. Fish and seafood exports are declining, at the same time, the import of fish and seafood is increasing. In 2011, it exported 54,778 dollars' worth of fish and seafood products, which declined to 29 million dollars in 2018; whereas, it imported 11 million dollars' worth of fish and seafood products in 2011, which had increased to 29 million dollars in 2018. The value of its imports is greater than the value of its imports; therefore, it's not self-sufficient in the production of fisheries and seafood.[215] After Kenya discusses Djibouti.

The production of fisheries and seafood is fluctuating in Djibouti. The total production of fish and seafood was 1667 tonnes in 2011, which reached 2298 tonnes in 2016. The production declined and reached 2102 tonnes in 2018. The total average production in the past 8 years was 2013 tonnes, and the share of capture production was 100 percent.[216]

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[214] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - National Aquaculture Sector Overview - Australia," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/fishery/countrysector/naso_australia/en.

[215] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Republic of Kenya," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/fishery/facp/KEN/en.

[216] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Republic of Djibouti," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/fishery/facp/DJI/en.

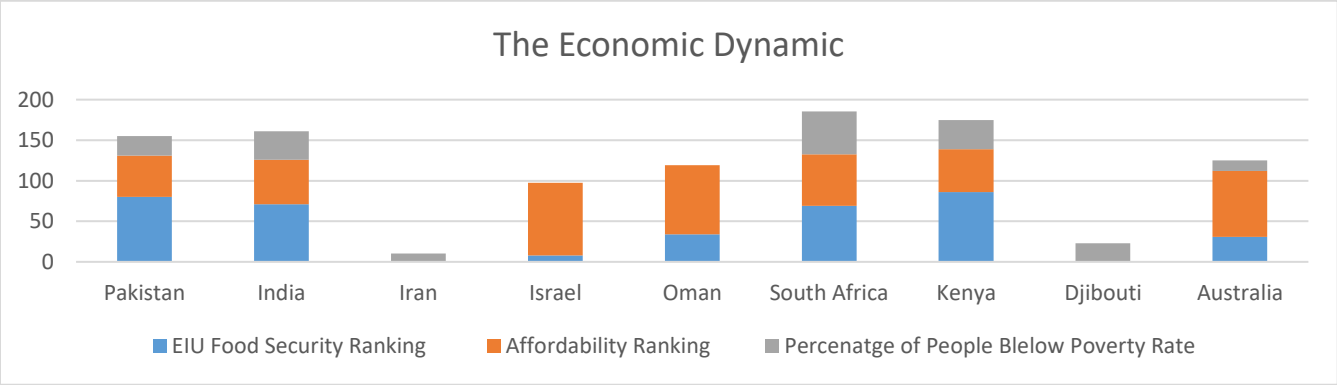
In 2011, Djibouti exported 22 million dollars' worth of fisheries and seafood products, which reached 57 million dollars' worth of fish and seafood products. Its exports are also fluctuating, while in 2011, it imported 10 million dollars' worth of fish and seafood products, and in 2018, it didn't import any fish and seafood products.

2.4.2 The Economic Dynamic:

The second aspect in the definition of food security is economic access to fisheries and seafood. Undertaken research discusses the economic dimension of food security.

On EIU food security ranking, India stands on 71 number out of 113, and its affordability score is 55 out of 100,[217] and its per capita GNI is 2120.[218] Its 35 % population is below the line of poverty[219]; furthermore, it is among LIFDC countries. [220]

The ranking of Pakistan in the EIU food security index is 80 out of 113, and its affordability score is 51[221]; furthermore, its GNI is 1410 dollars,[222] and 24 percent of the population is below the line of poverty.[223] Therefore, people can have problems with economic access to fisheries and seafood.



Source: World Bank/EIU

Figure 2.17 Economic Dynamic

[217] Economist Intelligence Unit, "India Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#India.
[218] world Bank, "GNI per Capita, Atlas Method (Current US$) - India | Data," Wolrd Bnak, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=IN.
[219] world Bank, "Poverty Headcount Ratio at National Poverty Lines (% of Population) - India | Data," WORLD BANK website, accessed March 16, 2021, https://data.worldbank.org/indicator/SI.POV.NAHC?end=2018&locations=IN&start=1960.
[220] Bank.
[221] Economist Intelligence Unit, "Pakistan Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Pakistan.
[222] world Bank, "GNI per Capita, Atlas Method (Current US$) - Pakistan | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=PK.
[223] world Bank, "Poverty Headcount Ratio at National Poverty Lines (% of Population) - Pakistan | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SI.POV.NAHC?end=2018&locations=PK&start=1960.

Oman EIU food security ranking was 42 in 2018, and its affordability score was 73.[224] Oman's per capita GNI is 43,470 dollars[225] and it's not among LIFD countries.

The EIU food security index and affordability score wasn't available for Iran. Its 10 percent population is living under the global poverty line. It is not among LIFDC countries. Its per capita GNI was 5300 US dollars in 2018. [226]

According to the Economist Intelligence Unit's food security index, the affordability score of Israel was 89.5 in 2019; its food security ranking 8th out of 113 countries.[227] The data related to poverty isn't avaible, and it is not among LIFDC countries.

According to the Economist Intelligence Unit's Food Security index, South Africa's food security ranking was 69 out 113 in 2018, and its affordability score was 63.[228] The per capita GNI was 6040 US dollars in South Africa, and it is not among LIFDC.[229] Its 53.2 percent population lives below the global line of poverty.[230]

Kenya is a low- middle -income country. The per capita GNI in Kenya is 1750 US dollars, [231]According to the EIU food security index, its score in the affordability category was 53 out of 100 and it's the EIU food security ranking was 86 out of 113 countries. [232]Its 36.1 percent population is living the global line of poverty.[233] It also comes under the LIFDC countries.

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[224] Economist Intelligence Unit, "United Arab Emirates Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#United Arab Emirates.

[225] world Bank, "GNI per Capita, Atlas Method (Current US$) - United Arab Emirates | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=AE.

[226] world Bank, "GNI per Capita, Atlas Method (Current US$) - Iran, Islamic Rep. | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=IR.

[227] Economist Intelligence Unit, "Israel Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Israel.

[228] Economist Intelligence Unit, "South Africa Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#South Africa.

[229] world Bank, "GNI per Capita, Atlas Method (Current US$) - South Africa | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=ZA.

[230] world Bank, "Poverty Headcount Ratio at National Poverty Lines (% of Population) - South Africa | Data," Wolrd Bank website, 2019, https://data.worldbank.org/indicator/SI.POV.NAHC?end=2018&locations=ZA&start=1960.

[231] world Bank, "GNI per Capita, Atlas Method (Current US$) - Kenya | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=KE.

[232] Economist Intelligence Unit, "Kenya Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Kenya.

[233] world Bank, "Poverty Headcount Ratio at National Poverty Lines (% of Population) - Kenya | Data," Wolrd Bank website, 2019, https://data.worldbank.org/indicator/SI.POV.NAHC?end=2018&locations=KE&start=1960.

The per capita GNI in Djibouti is 3310 US dollars.[234] Its 23 percent population lives below the global line of poverty. It is among LIDFC countries.[235]

Australia is among the richest countries. Per capita income in Australia is around 51760 dollars. Its EIU food security ranking is 31 out of 113 and affordability is 81[236]; furthermore, its GNI per capita is 55100 dollars.[237] Its 13 percent population lives under the global line of poverty[238], and it is not among LIFDC countries.

2.4.3 The Preference Dynamic:

The third aspect in the definition of food security is the preference of people. In 2011, per capita, fish consumption was 1.99 kg, which is very low than the FAO recommended level. In 2017, the per capita consumption of fish and seafood was 1.72 kg. [239]

Fish and seafood are among the favorite foods of Australians. Per capita consumption of fish and seafood was 25 kg in 2011, which is still the same in 2018. [240]

The per capita consumption of fish and seafood was 5.17 kg in 2011, which reached 6.90 kg in 2017.[241] India has a huge middle class, and millions of people came out of poverty. The rise in the middle class also increased the demand for protein-rich food, but in India, it didn't impact as it did in China. People rely on land-based food more than seafood and fisheries. Vegetables are a more preferred source of food as compared to meat.

The per capita consumption of fish and seafood was 9 kg in 2011, which reached 11 kg in 2018. It is according to the recommendation of WHO. It means that the consumption of fish and seafood

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[234] World Bank, "GNI per Capita, Atlas Method (Current US$) - Djibouti | Data," Wolrd Bank website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=DJ.

[235] World Bank, "Poverty Headcount Ratio at National Poverty Lines (% of Population) - Djibouti | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SI.POV.NAHC?end=2018&locations=DJ&start=1960.

[236] Economist Intelligence Unit, "Australia Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Australia.

[237] World Bank, "GNI per Capita, Atlas Method (Current US$) - Australia | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=AU.

[238] World Bank, "Prevalence of Undernourishment (% of Population) - Australia | Data," WORLD BANK We, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=AU.

[239] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," Our world in Data, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~PAK.

[240] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," United Nations Food and Agriculture Organization, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~AUS.

[241] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," Our world in Data, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~IND.

is increasing in Iran. Despite the decrease in the per capita income and soaring inflation, the increase in per capita consumption shows that Iranians have economic access to fish and seafood.[242]

The per capita consumption of fish and seafood is very high in Oman. In 2011, the per capita consumption of fish and seafood was 26.93 kg, which reached 28.54 kg in 2018. It means that Fish and seafood are the desired food item in Oman.[243]

In 2011, the per capita consumption of fish and seafood was 23 kg, which reached 25 kg in 2018. The consumption of fish and seafood witnessed a 2 kg increase in 7 years. It is higher than WHO recommended level. Undoubtedly, Fish and seafood are preferred food items in Israel. The food security definition also focuses on the nutritional aspect of food. [244]

The per capita consumption of fish and seafood was 5.67 kg, which slightly increased to 5.97 kg in 2018. It means the consumption of fish and seafood is very low in South Africa; furthermore, it is less than the recommended value of WHO. These stats are showing that fishers and seafood don't play an important role in providing food security in South Africa. The food security definitions consider nutritional security as an important component of food security. [245]

Fish and seafood are not highly consumed food in Kenya. The per capita consumption of fish and seafood was just 4.51 percent in 2011, which has declined to 3.98 percent.[246]

The per capita consumption of fisheries and seafood remained low in Djibouti. In 2011, the per capita consumption of fisheries and seafood was just 3 kg, which reached 5.76 kg in 2016 and declined to 3.69 kg in 2018. The per capita consumption of Djibouti is lower than the

[242] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," United Nations Food and Agriculture Organization, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~IRN.

[243] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1990 to 2017," United Nations, 20191, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~OMN.

[244] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," United Nations Food and Agriculture Organization, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~ISR.

[245] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," United Nations Food and Agriculture Organization, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~ZAF.

[246] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," United Nations Food and Agriculture Organization, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~KEN.

recommended value of the WHO, and it is also lower than the average value of per capita consumption in the world. [247]

2.4.4 The Nutritional Security Dynamic:

The fourth important aspect of the food security definition is the nutritional dynamic. It tells us about the contribution of fisheries and seafood in providing food security to people and the general situation of the nutritional aspects.

The contribution of Fish and seafood in providing protein to the Indian people has increased from 8.2 percent to 13 percent in 2017.[248] According to the Global Hunger Index, the level of hunger in India is alarming.[249] Its 14 percent population is undernourished,[250] and according to the WWF fisheries and seafood dependence Index, its reliance on fisheries and seafood is medium. [251]

Pakistani people get only 2 percent of their animal protein from fisheries and seafood[252]; moreover, 20 percent of the population is undernourished,[253] and according to the GHI, the situation of hunger is serious.[254] According to the WWF, its dependence on fisheries and seafood is medium.

In the global hunger index, the situation of hunger is low in Iran, which shows that the hunger rate is low in Iran, and it is also not included in FAO food-deficit countries.[255] According to WWF, Iran's dependence on marine fisheries for food security is medium.[256] The prevalence of

[247] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," United Nations Food and Agriculture Organization, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~DJI.

[248] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[249] Global Hunger Index, "India - Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels" (Dehli, 2019), https://www.globalhungerindex.org/india.html.

[250] world Bank, "Prevalence of Undernourishment (% of Population) - India | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=IN.

[251] Quaas et al., "Fishing for Proteins."

[252] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[253] world Bank, "Prevalence of Undernourishment (% of Population) - Pakistan | Data," WORLD BANK We, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=PK.

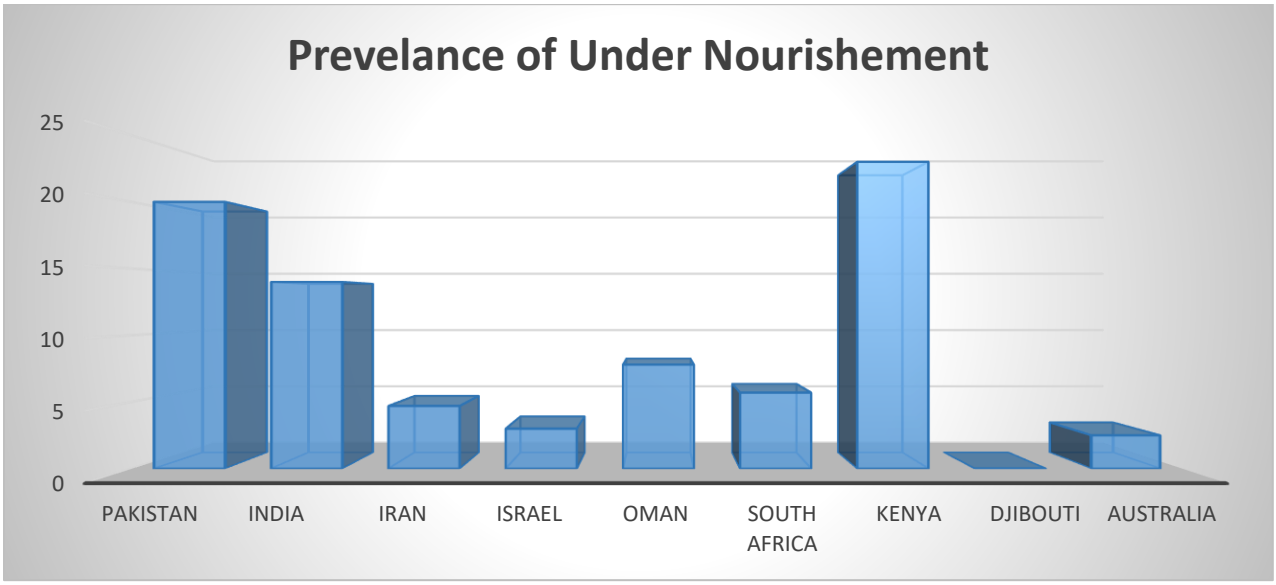
[254] Global Hunger Index, "Pakistan - Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels" (ISLAMABAD, 2019), https://www.globalhungerindex.org/pakistan.html.

[255] Global Hunger Index, "Iran - Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels" (Theran, 2019), https://www.globalhungerindex.org/iran.html.

[256] Quaas et al., "Fishing for Proteins."

undernourishment is 4.7 percent in Iran[257]. It is not highly dependent on marine fish and seafood for meeting its food security needs.

Nutritional security is also an important aspect in the definition of food security. People in Oman get 18 percent of animal protein from fisheries and seafood.[258] In Oman, 7.8 percent of the population is facing the problem of undernourishment.[259] According to the Global Hunger Index, the level of hunger is moderate in Oman.[260]



Source: FAO

Figure 2.18 percentage of Undernourished Population

According to WWF, Israel's reliance on fish and seafood is medium. Israelis don't depend on fish and seafood for their food security needs; furthermore, Israel obtains a small number of fish and seafood from marine capture.[261] Therefore, the Indian Ocean doesn't play a vital role in providing food security to Israel. According to GHI, the situation of hunger is low in Israel, and just 3 percent of the population is facing the problem of undernourishment.

People in South Africa are getting 5.1 percent animal protein from fisheries and seafood. According to Global Hunger Index, the South African rating is 13.5, which means that South

[257] world Bank, "Prevalence of Undernourishment (% of Population) - Iran, Islamic Rep. | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=IR.

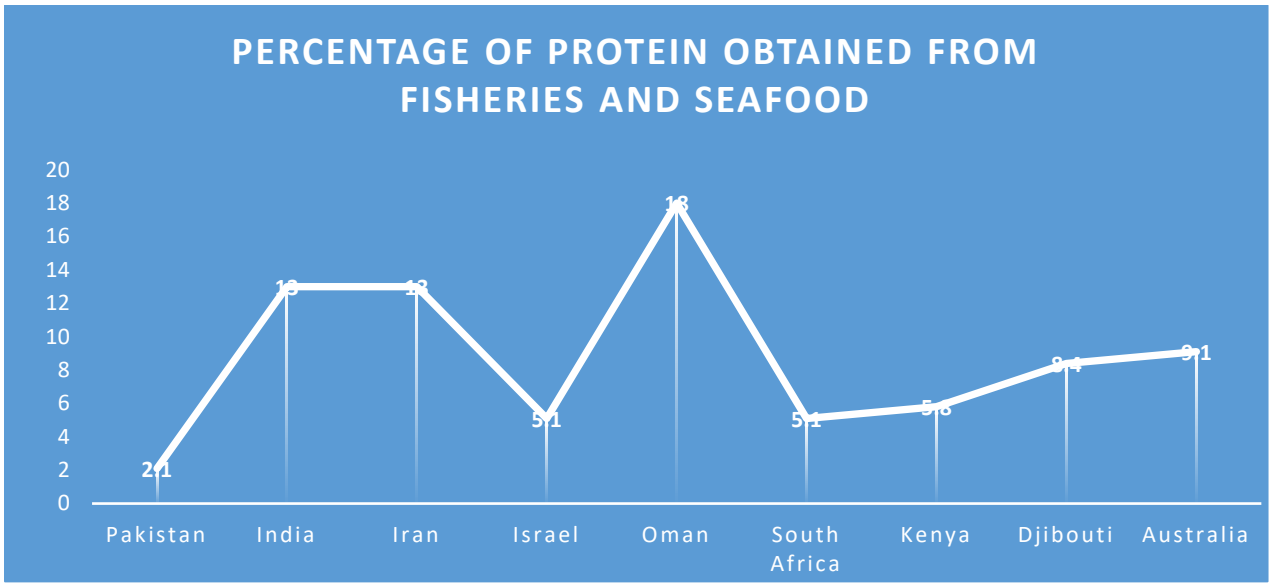
[258] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[259] world Bank, "Prevalence of Undernourishment (% of Population) - Oman | Data," Wolrd Bank website, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=OM.

[260] Global Hunger Index, "Oman - Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels" (London, 2019), https://www.globalhungerindex.org/oman.html.

[261] Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," 2019.

Africa hunger is moderate in South Africa.[262] Its 7.5 percent of the population is facing the problem of undernourishment.[263]



Source: FAO

Figure 2.19 Percentage of protein Obtained from fisheries

Australians get 9.1 percent of protein from fisheries and seafood.[264] In Australia, just 2.5 percent of people are facing the problem of undernourishment.[265]

People in Kenya get 5.8 percent of animal protein from fisheries and seafood.[266] According to the WWF, Kenya's dependence on marine fish and seafood for protein is medium.[267] It doesn't depend on fish and seafood for nutritional needs. It ranks 86 in the hunger index, it is among the list of countries where the situation of food security is serious.[268] Its 23 percent population is facing the problem of under-nourishment. [269]

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[262] Global Hunger Index, "South Africa - Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels" (London, 2019), https://www.globalhungerindex.org/south-africa.html.

[263] world Bank, "Prevalence of Undernourishment (% of Population) - South Africa | Data," Wolrd Bank website, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=ZA.

[264] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[265] Bank, "Prevalence of Undernourishment (% of Population) - Australia | Data."

[266] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[267] Quaas et al., "Fishing for Proteins."

[268] Global Hunger Index, "Kenya - Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels," Global Hunger Index, 2019, https://www.globalhungerindex.org/kenya.html.

[269] world Bank, "Prevalence of Undernourishment (% of Population) - Kenya | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=KE.

According to the GHI, the hunger situation is alarming in Djibouti. According to the FAO, it gets only 8.4 percent of animal protein from fisheries and seafood.[270] Its dependence on fish and seafood for animal protein is low; however, the level of malnutrition is very high in Djibouti, which makes 8 percent protein more valuable.

2.5 Food Security Dynamics in Low Dependent Countries:

Undertaken research divides countries in four groups. In low dependence groups those countries are placed that according to the WWF, rely on fisheries and seafood resource less. These countries are low dependent on fisheries and seafood resources. Undertaken research describes here the production dynamic of fisheries and seafood. It also study physical access of people to fisheries and seafood. Without Physical access, fisheries and seafood cannot become part of food security. Then it describes the economic dynamics. After it, describes dynamic of preference, and nutritional dynamic.

2.5.1 The Production Dynamic:

The first part of the food security definition is the physical access of people to food, and in this case, physical access to fisheries and seafood. For ensuring physical access of people to fisheries and seafood, the production of food is vital. Below are the details of fisheries production in low dependent countries.

In 2011, the contribution of captured fish and seafood was 64481 million tonnes in Saudi Arabia, which reached 68776 million tonnes in 2018. In the same period, the contribution of aquaculture was 16076 tonnes and 72000 tonnes respectively. In 2011, the contribution of marine capture was 64481 million tonnes that reached 68776 million tonnes in 2018. In the past 8 years, the total average production was 100,265, while the contribution of marine capture fisheries and seafood was 67 percent. [271]

There was no data available for inland capture. Saudi Arabia also imports a large number of fish and seafood products to meet the demand for fish and seafood. The value of its imports are greater than the value of its imports; therefore, it is not self-sufficient in the production of fisheries and seafood. The per capita supply of fisheries and seafood was 11 kg in 2018.[272]

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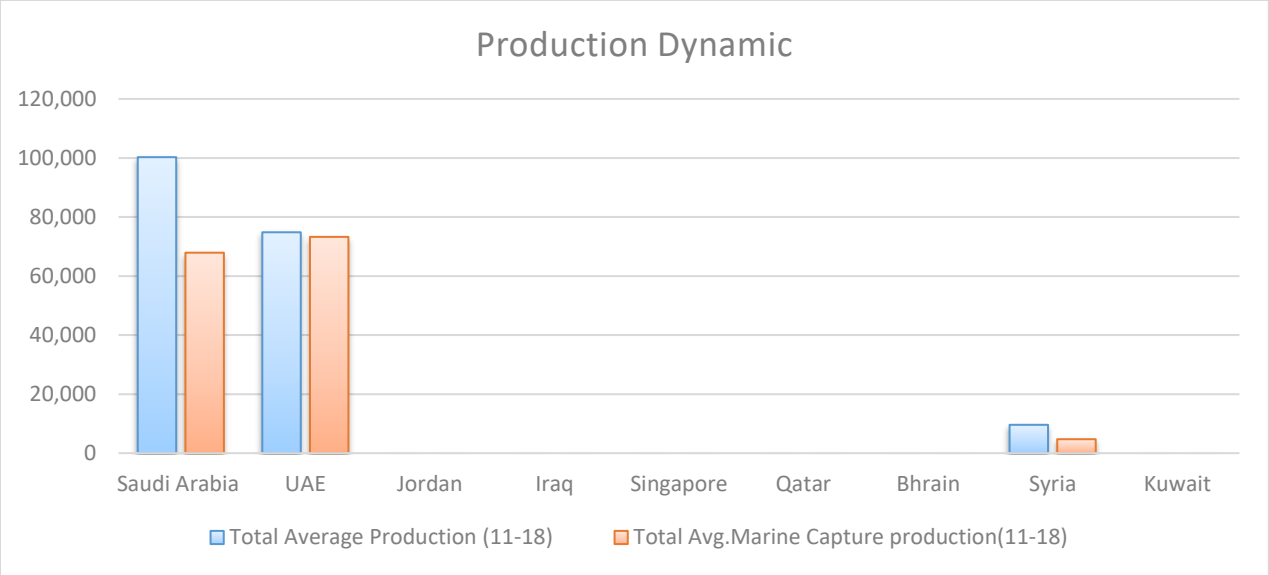
[270] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[271] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The Kingdom of Saudi Arabia," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/fishery/facp/SAU/en.

[272] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.



Source: FAO

Figure 2.20 Production Dynamic

In 2011, the contribution of captured fish and seafood was 75147 tonnes in UAE, which declined to 73000 tonnes in 2018. The Aquaculture production was just 300 tonnes in 2011 that reached 3 thousand tonnes in 2018. Out of the total output, the share of marine capture was 300 tonnes in 2011, which reached 3 thousand tonnes in 2018. The total average production of the past 8 years was 74,820, and the share of marine capture was 97 percent. The production of seafood and fisheries is not enough to meet the domestic demand. It imports 70 percent of fish and seafood products to meet the domestic need.[273]

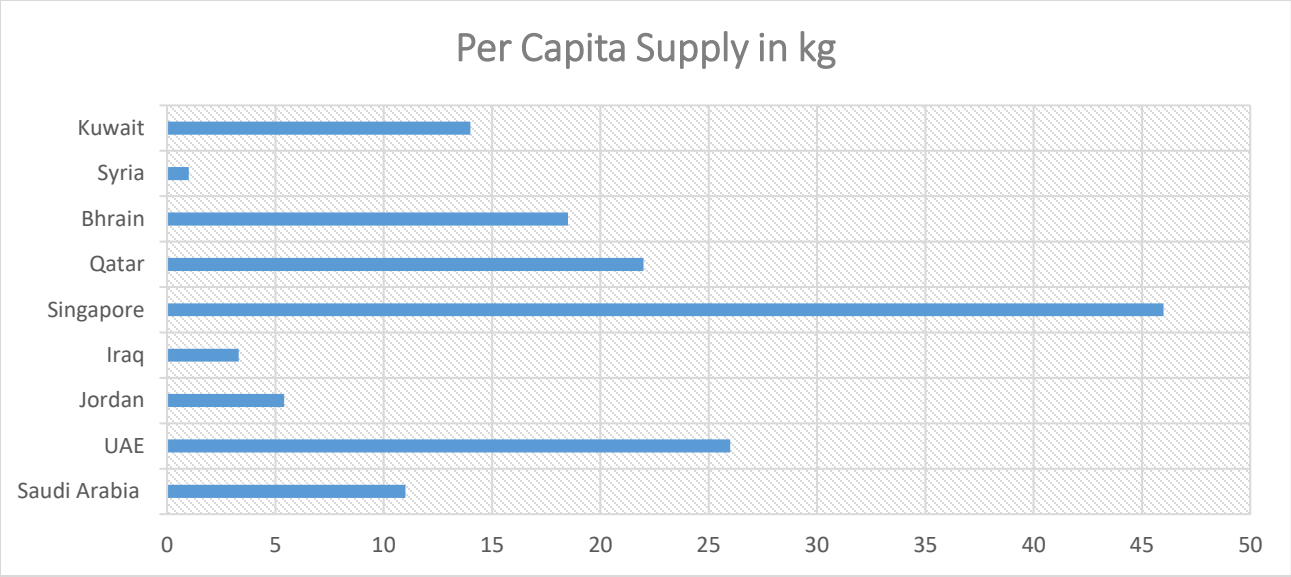
The production of fisheries and seafood data was not available for Jordan. In 2017, its total production was 1758 tonnes. The per capita of fisheries and seafood supply in Sudan is 5.4 kg.[274]

The production of fisheries and seafood data was not available for Iraq as well. In 2017, its total production was 67,034 tonnes. The per capita of fisheries and seafood supply in Iraq was 3.3 kg.

In 2011, the total production of fisheries and seafood was 4300 tonnes in Kuwait, which declined to 2900 in 2018. In 2011, the contribution of marine capture was 4038 tonnes, while the contribution of marine capture was 2871 tonnes in 2018. These statistics show that marine capture played a major in the production of fisheries and seafood.

[273] United Nations Food and Agricuture Organization, "FAO Fisheries & Aquaculture - Fishery and Aquaculture Country Profiles - The United Arab Emirates," United Nations Food and Agriculture Organization, 2019, http://www.fao.org/fishery/facp/ARE/en.

[274] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.



Source: FAO *Figure 2.21 Per capita supply*

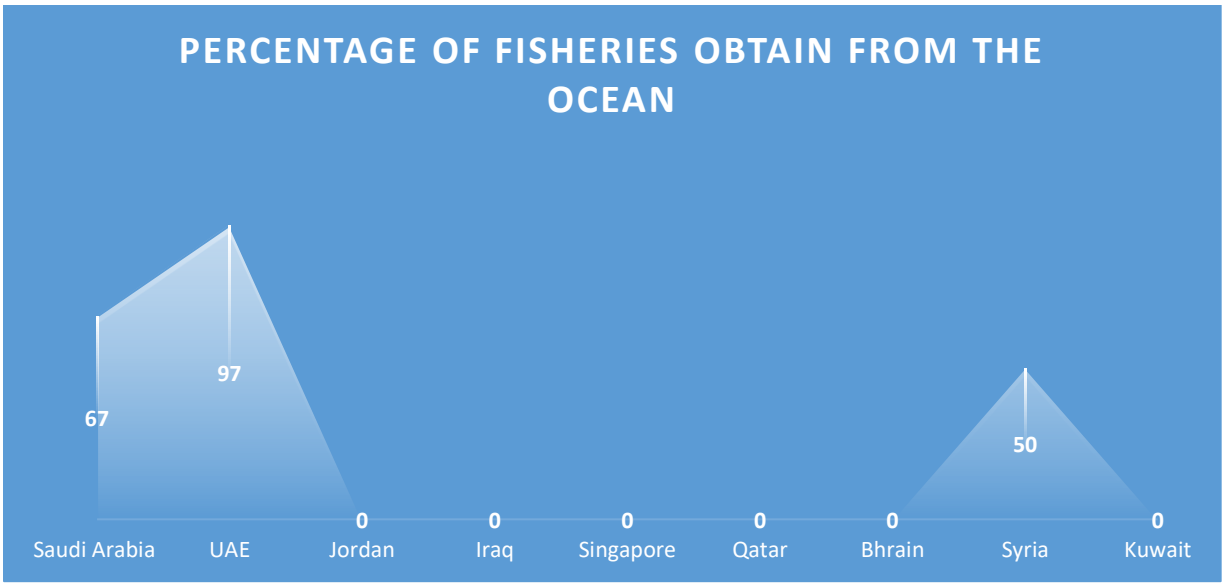
In 2011, Kuwait imported 111 million dollars' worth of fisheries and seafood products, whereas in 2018, it imported 228 million dollars' worth of fisheries and seafood products, and the value of exports remained zero. The value of export is less than the value of import, which means that it doesn't have a stable supply of fisheries and seafood products; however, it is filling the gap in the demand and the supply by importing fish and seafood. The second element in the definition of food security is economic access to fish and seafood.[275]

Self-Sufficiency Table

Country	Self Sufficiency in Fisheries Production
Saudi Arabia	No
UAE	NO
Jordan	NO
Iraq	No
Singapore	NO
Qatar	NO
Bhrain	NO
Syria	NO
Kuwait	NO

Source: FAO *Table 2.4 Self-Sufficiency Table*

[275] Organization.



Source: FAO *Figure 2.22 Percentage of fisheries obtained from seafood*

The comprehensive data on fisheries and seafood in Qatar is not available. According to the estimates of FAO, in 2010 the total production of capture fisheries and seafood was 14000 tonnes, which reached 16 thousand tonnes in 2014, which declined to 15000 tonnes in 2015.

It imported 99 million dollars' worth of fisheries and seafood products in 2015, while its exports were worth 1 million dollars. Its imports are greater than its exports which means that it is not self–sufficient in the production of fisheries and seafood. Its per capita supply is 22 kg.

The details of production data were not available for Singapore. In 2017, its production was 77002 tonnes, and it was meeting demand for fisheries and seafood through import of fisheries and seafood. The value of imports is greater than the value of its exports; therefore, it is not self-sufficient in the production of fisheries and seafood. The per capita of fisheries and seafood supply in Singapore is 46 kg.[276]

In 2011, the contribution of fisheries and seafood was 5900 tonnes in Syria, and the contribution of aquaculture was 7500 tonnes. In 2018, the contribution of aquaculture was 2350, while the contribution of capture production was 4374 tonnes. The total average production in the past 8 years was 9,593 tonnes, and the share of capture production was 50 percent. In 2018, it imported 471 million dollars' worth of fisheries and seafood products, while the value of export was 69

[276] Organization.

million dollars. The value of imports is greater than the value of exports. It means that Syria doesn't have self-sufficiency in fisheries and seafood products, and the per capita supply is just 1.6 kg.[277] The details of production data were not available for Bahrain. In 2017, its production was 15000 tonnes, and it was meeting demand of fisheries and seafood through import of fisheries and seafood.

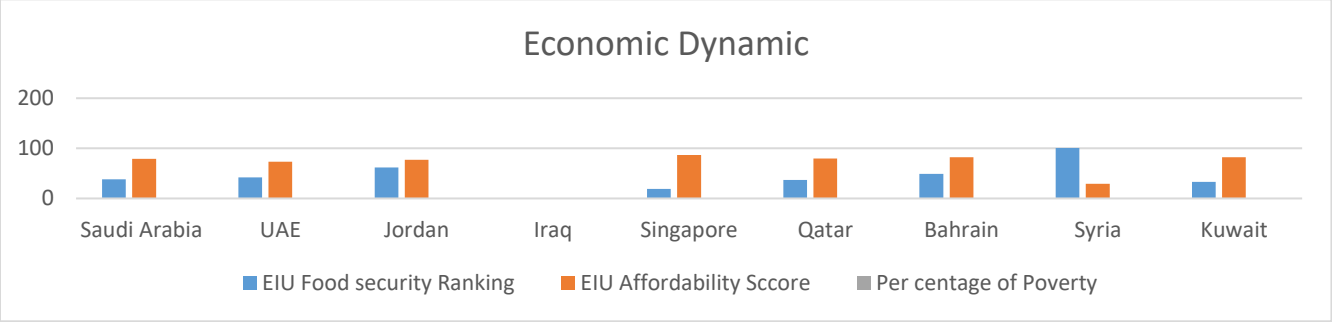
2.5.2 The Economic Dynamic of Food Security

Economic dynamic of food security definition is important to ensure physical access to food. Below is the detail of the economic dynamic of low dependent countries.

Saudi Arabia is among the richest countries. According to the EIU food security ranking, it stands on 38 out of 113 countries; its affordability score is 79. [278]The per capita GNI is 22840,[279] and it's not among LIFDC countries.

UAE EIU food security ranking was 42 in 2018, and its affordability score was 73.[280] Its per capita GNI is 43,470 dollars,[281] and it's not among LIFD countries.

Kuwait is among higher-income countries. In 2019, the per capita GNI in Kuwait was 33, 590 US dollars.[282] In the EIU food security ranking, its affordability score was 82. Its ranking on the EIU food security index was 33.[283] It is not among LIFDC countries.



Source: World Bank/EIU

Figure 2.23 Economic dynamic

[277] Organization.

[278] Economist Intelligence Unit, "Saudi Arabia Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Saudi Arabia.

[279] World Bank, "GNI per Capita, Atlas Method (Current US$) - Saudi Arabia | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=SA.

[280] Unit, "United Arab Emirates Food Security."

[281] Bank, "GNI per Capita, Atlas Method (Current US$) - United Arab Emirates | Data."

[282] World Bank, "GNI per Capita, Atlas Method (Current US$) - Kuwait | Data," Wolrd Bank website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=KW.

[283] Economist Intelligence Unit, "Kuwait Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Kuwait.

In the EIU food security ranking, Bahrain was placed on 49 out of 113 countries, and its affordability ranking was 82 out of 100.[284] Its per capita GNI is 22,110 US dollars.[285] It is not among LIFDC countries. Iraq's EIU food security ranking and affordability ranking were not available. Its per capita GNI is 5740 US dollars. It is not among LIFDC countries.

Qatar is among the richest countries in the world. The per capita GNI was 61,180 US dollars in 2019.[286] In the EIU food security ranking, it was placed 37 out of 113 countries, and its affordability score was 80.[287] It is not among LIFDC countries.

Singapore is not among the LICFD countries. The per capita GNI is just 59590 dollars.[288] According to the EIU food security index, its ranking is 19 out of 113 countries— and its affordability score is 87; therefore, people don't have economic access to fisheries and seafood.[289]

Syria is among the LICFD countries. The per capita income is just 1800 dollars.[290] According to the EIU food security index, its ranking is 101 out of 113 countries, and its affordability score is 29; therefore, people don't have economic access to fisheries and seafood. [291]In the EIU food security ranking, Jordan was placed 62 out of 113 countries, and its affordability score was 77 out of 100.[292] Its per capita GNI is 59590 US dollars.[293] It is not among LIFDC countries.

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[284] Economist Intelligence Unit, "Bahrain Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Bahrain.

[285] World Bank, "GNI per Capita, Atlas Method (Current US$) - Bahrain | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=BH.

[286] world Bank, "GNI per Capita, Atlas Method (Current US$) - Qatar | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=QA.

[287] Economist Intelligence Unit, "Qatar Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Qatar.

[288] world Bank, "GNI per Capita, Atlas Method (Current US$) - Singapore | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=SG.

[289] Economist Intelligence Unit, "Singapore Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Singapore.

[290] World Bank, "GNI per Capita, Atlas Method (Current US$) - Syrian Arab Republic | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=SY.

[291] Economist Intelligence Unit, "Syria Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Syria.

[292] Economist Intelligence Unit, "Jordan Food Security," Economist Intelliegnce Unit, 2019, https://foodsecurityindex.eiu.com/Country/Details#Jordan.

[293] world Bank, "GNI per Capita, Atlas Method (Current US$) - Jordan | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=JO.

2.5.3 The Preference Dynamic:

Preference of food is an important dynamic of food security definition, because it tells us about the choice of people in eating a certain food. Below are the details of per capita consumption in low dependent countries.

In 2011, the per capita consumption of fish and seafood was 11.05 kg in Saudi Arabia. It reached to13.48 kg in 2013 that had declined to 11.33 kg in 2017. The per capita consumption of fish and seafood is less than the recommended value of FAO. [294]

The per capita consumption of fish and seafood was 23.85 kg in 2011, which increased by 25 kg, but in 2014 it declined to 24 kg in 2018. This per capita consumption shows that people are consuming more fisheries than the recommended value of the FAO. Per capita consumption shows that fish and seafood are an important constituent of food security in the UAE. [295]

Bahrain data of per capita consumption of fisheries and seafood wasn't available. The preference of people is another variable in the definition of food security. In Qatar, the per capita consumption of fisheries and seafood was around 22 kg in 2017, which is higher than the recommended value of the WHO and also from an average fish consumption of the world. Nutritional security is another important variable in the definition of food security.

In 2011, Jordan's per capita consumption of fisheries and seafood was 5.78 and in 2017 per capita consumption was 5.87 kg.[296]

Iraq data of per capita consumption of fisheries and seafood wasn't available. The preference for food is another variable in the definition of food security. Syria's data of per capita consumption of fisheries and seafood wasn't available.

2.5.4 The Nutritional Aspect:

The nutritional aspect is a dynamic of food security that tells about the nutritional value of food. It tells about the role fisheries and seafood in providing protein in low dependent countries of the

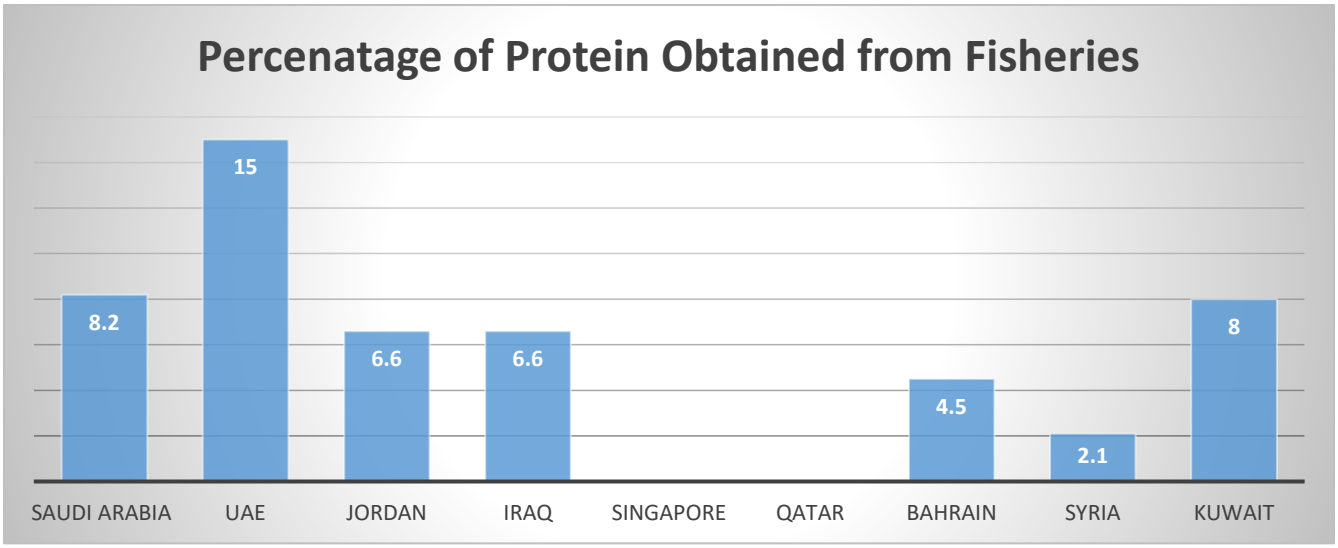
[294] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," United Nations Food and Agriculture Organization, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~SAU.

[295] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," United Nations Food and Agriculture Organization, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~ARE.

[296] United Nations Food and Agricuture Organization, "Fish and Seafood Consumption per Capita, 1961 to 2017," United Nations Food and Agriculture Organization, 2019, https://ourworldindata.org/grapher/fish-and-seafood-consumption-per-capita?tab=chart&region=Asia&country=~JOR.

IOR. Furthermore, it also tells about the importance of fisheries and seafood in the context of a country.

People only get 2.1 percent of animal protein from fisheries and seafood in Syria.[297] According to GHI, the situation is alarming in Syria. [298]The data related to fisheries dependence wasn't available for Syria.



Source: FAO

Figure 2.24 Percentage of fisheries obtained from seafood

According to GHI, the level of hunger was low in Iraq. It gets 6.6 percent protein from fisheries and seafood.[299] Its dependence on fisheries and seafood is low.[300] Its 23.7 percent population is facing the problem of undernourishment.

According to GHI, the level of hunger was low in Jordan.[301] It gets 6.6 percent protein from fisheries and seafood.[302] Its dependence on fisheries and seafood is low.[303]

According to the FAO, Qatar is among the countries where the per capita consumption of fish and seafood is higher than 20 kg, and people get 6 to 10 g of protein per capita daily from fish and

[297] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[298] Global Hunger Index, "Syria - Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels," Global Hunger Index, 2019, https://www.globalhungerindex.org/syria.html.

[299] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[300] Quaas et al., "Fishing for Proteins."

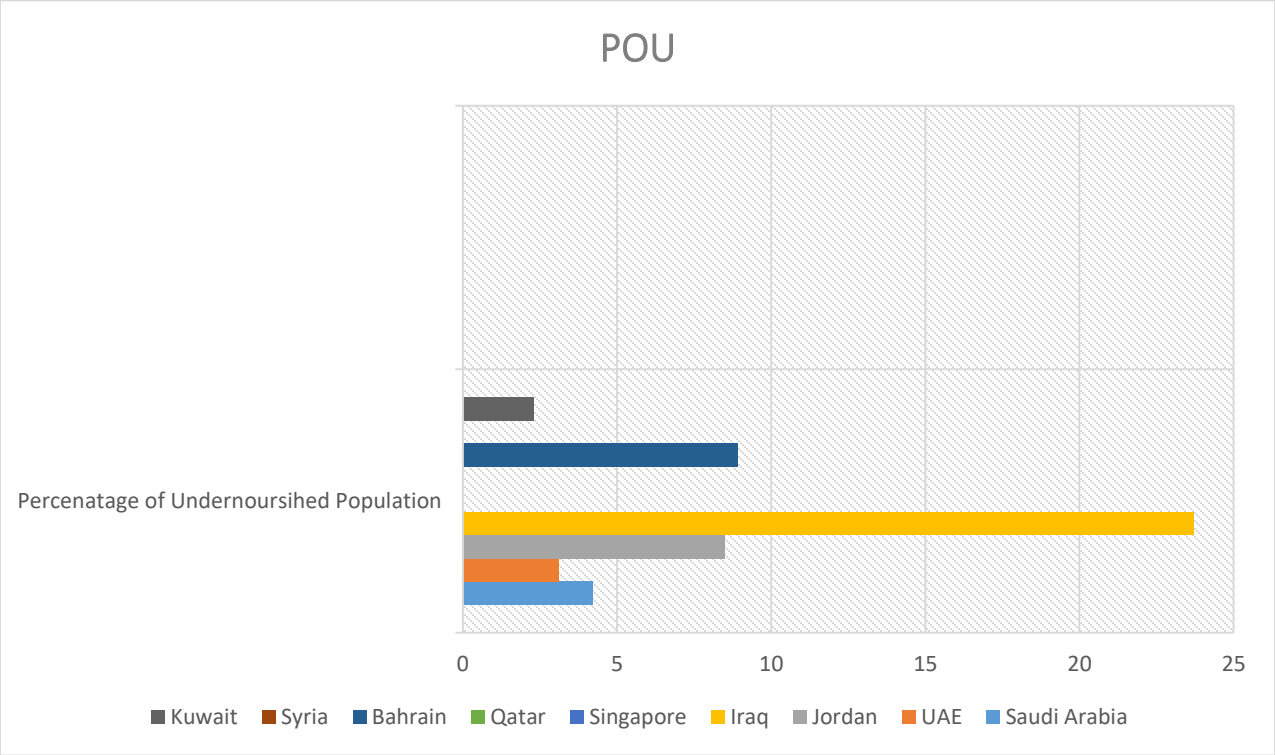
[301] Global Hunger Index, "Jordan - Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels," Global Hunger Index, 2019, https://www.globalhungerindex.org/jordan.html.

[302] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[303] Quaas et al., "Fishing for Proteins."

seafood.[304] It is not among the LIFDC countries, and its ranking in the GHI was also not available; furthermore, due to less data, WWF fish and seafood dependence index ranking was also not available. People in Bahrain get 4.5 percent protein from fisheries and seafood.[305] Its 8.9 percent population is facing undernourishment.[306]

People get 8 percent animal protein from fisheries and seafood in Saudi Arabia.[307] The prevalence of undernourishment is 4 percent.[308]Furthermore, according to the Global Hunger Index, the situation of hunger is low in Saudi Arabia. [309]



Source: world Bank/ FAO

Figure 2.25 percentage of undernourished population

[304] Unit, "Qatar Food Security."

[305] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[306] World Bank, "Prevalence of Undernourishment (% of Population) | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS.

[307] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

[308] World Bank, "Prevalence of Undernourishment (% of Population) - Saudi Arabia | Data," Wolrd Bank website, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=SA.

[309] Global Hunger Index, "Saudi Arabia - Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels," *Global Hunger Index* (Riyadh, 2019), https://www.globalhungerindex.org/saudi-arabia.html.

Nutritional security is another variable in the definition of food security. People in the UAE get 15 percent animal protein from fisheries and seafood.[310] The prevalence of nourishment is just 3 percent. [311]Data of GHI and WWF wasn't available for the UAE.

Conclusion:

Fisheries and seafood are an important part of food security in IOR. There many countries where the per capita consumption is very high, and there are countries where it is low. Countries with low production have high per capita supply due to their strong economic condition. Therefore, food security is a vast concept can be understood by understanding the interaction of different variables.

[310] world Bank, "Prevalence of Undernourishment (% of Population) - United Arab Emirates | Data," WORLD BANK website, 2019, https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=AE.
[311] Organization, *FAO Yearbook. Fishery and Aquaculture Statistics 2018/FAO*.

Chapter 3: Fisheries Resources In IOR: Competition or Cooperation.

Fisheries resources are important in the Indian Ocean. They are providing food security to billions of people. Therefore, their importance is palpable. Competition for fisheries resources is a possibility. The undertaken research in this chapter: first discusses the main variables of the competition for fisheries resources, then it discusses their possible causes of competition; in addition, it describes governance structure and its problems. Then it discusses interaction of different variables using data from chapter 2 and 3 to know possibility for competition and collaboration. Furthermore, it discusses impact of all these variables on non-state actors. Then it discusses instances competition among states and non-state actors. At the last, undertaken research gives conclusion.

3. The Reasons for the Fisheries Competition?

Fisheries and seafood play an important role in providing food security to people of the Indian Ocean Region. These resources not only provide food but also employment to millions of people in the Indian Ocean region; therefore, it is an important component of food security in IOR, thereby increasing competition for fisheries and seafood resources. The population in the Indian Ocean region will increase. Consequently, the demand for fisheries and seafood will increase as well.[312] There is another phenomena that will impact the demand for fisheries and seafood is the rise of the Middle Class. The competition for fisheries and seafood will increase. Besides, Climate change is impacting the fisheries and seafood resources. It is completely changing the composition and nature of the sea water. It is exacerbating the acidic nature of the seawater.[313] Furthermore, due to the increasing population and rising middle class the demand for the sea traffic has increased as well. Population increase on the coastal cities is also impacting fisheries and seafood population. Furthermore, illegal nature of fishing practices and lack of effective governance model are contributing to fisheries governance. [314]

[312] K. R. Singh, "Regional Cooperation in the Bay of Bengal: Non-conventional Threats—Maritime Dimension," *Strategic Analysis* 24, no. 12 (2001): 2199–2217, https://doi.org/10.1080/09700160108455348.
[313] Andrew K. Carlson and Nathan J. Lederman, "Climate Change and Fisheries Education," *Fisheries* 41, no. 7 (2016): 411–12, https://doi.org/10.1080/03632415.2016.1182510.
[314] Dennis Rumley, Sanjay Chaturvedi, and Vijay Sakhuja, *Fisheries Exploitation in the Indian Ocean Region*, ed. Dennis Rumley, Sanjay. Chaturvedi, and Vijay. Sakhuja, *Fisheries Exploitation in the Indian Ocean: Threats and Opportunities*, 1st ed. (Singapore: Institue of South Asian Studies, 2009), https://doi.org/10.1355/9789814279406-004.

3.1 Increase in Population and Middle Class.

The Indian Ocean is the third largest Ocean of the world and covers an area of 70 million square kilometers. It has a population of 2.49 billion people, and the world population is around 6.74 billion people.[315] According to estimates of the United Nations, the world population will reach 8.6 billion in 2030, 8.6 billion in 2030, 9.8 billion in 2050, and 11.2 billion in 2100. Furthermore, 81 million people are becoming part of the world population every year. According to the UN, these nine countries such as India, Pakistan, United Republic of Tanzania, Indonesia, the United States of America, Ethiopia, Uganda, and Democratic Republic of Congo will witness an increase in their population. Out of these nine countries, 4 are part of IOR.[316] It means that IOR will remain the center of population growth, and population concentration in this region will be more than any other region in the world. Increase in the concentration of the population will increase the demand for food as well. Consequently, the demand for fisheries and seafood will increase as well. Overall, food demand will increase 58 to 95 percent. [317]

The demand for fisheries and seafood resources won't only depend on the population growth in the IOR region, but it will also depend on overall population growth in the world, because fisheries and seafood contribute in providing food security in two ways. In one way, it is a direct source of food and protein; it also provides food security by providing employment to a large population. According to the United Nations Food and Agriculture Organization, a decent employment opportunity plays a very important role in eradicating poverty and has a strong connection with elimination of food insecurity. There is a strong link available between unemployment, loss of income and poverty. It is, generally, accepted that unemployment impacts the well-being of people. According to a study, there is a propionate relationship between unemployment and poverty.[318]

According to Nobel Laureate Amartya Sen, food security and poverty have a strong connection. During a FAO conference she said, "The main factor behind the continuation of hunger in the world is poverty, despite the increasing prosperity of the modern world in average total".

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[315] Shibdas Burman, "Indian Ocean," *Science* 157, no. 3791 (1967): 962–64, https://doi.org/10.1126/science.157.3791.962.

[316] United Nations, "World Population Projected to Reach 9.8 Billion in 2050, and 11.2 Billion in 2100 | UN DESA | United Nations Department of Economic and Social Affairs," website, 2017, https://www.un.org/development/desa/en/news/population/world-population-prospects-2017.html.

[317] FAO, *The State of World Fisheries and Aquaculture 2020. Sustainability in Action.*, *Fao*, 2020, https://doi.org/https://doi.org/10.4060/ca9229en.

[318] Mary Hood, "The Interplay between Poverty, Unemployment, Family Disruption and All Types of Child Abuse," *Children Australia* 23, no. 2 (1998): 28–32, https://doi.org/10.1017/s1035077200008609.

[319]Poverty impacts people's access to fisheries and seafood; therefore, even in the countries where fisheries and seafood are not a direct part of food security, they can play an important role in providing indirect food security through the primary and secondary industry.

The Export of fisheries and seafood resources also contributes in providing food security to people. As shown in the Chapter 2, lots of countries in IOR depend on import of fisheries and seafood resources to meet growing demand and many other countries in the world also import fisheries and seafood resources to fully full fill domestic demand. India and Thailand are among top 10 seafood and fisheries exporting countries and Indonesia is among top 12. Due to above mentioned reasons, population growth in the whole world contributes to competition for fisheries resources in IOR.[320] The increasing demand for fisheries resources will exacerbate competition, because fisheries resources are also declining. This will lead towards other problems such as overfishing that further deteriorates the availability of fisheries and seafood resources; thus, it will enhance the chances of competition for fisheries and seafood resources in IOR. With the Population growth, there is another phenomena that is going to impact the competition for fisheries and seafood resources is the decline of poverty and rise of Middle Class.

The most significant development happened in the world in 2018; a half of the world population became Middle Class, and 5 people had been joining the middle class every second till 2020. The poor and vulnerable people are not a majority in the world now.[321] The Middle class doesn't have any single definition, and there can be disagreement among experts on its definition. The main characteristics of the definition that was used in this study was: people have enough income to buy products like refrigerator, washing machine, and motorcycles; furthermore, they have enough income to participate in entertaining activities such as watching movie in Cinema. According to this definition, the threshold of Middle Class income was kept at 11 dollars. A person who has 11 dollars to spend daily will be considered a part of the middle class. From 2011 to 2019, the global Middle Class had been increasing with great speed.

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[319] Jenny Donelan, *The State of Food Insecurity in the World*, *United Nations Food and Agriculture Organization*, 1st ed. (Rome: United Nations Food and Agriculture Organization, 2017), https://doi.org/10.1002/msid.1007.

[320] world Atlas, "Top Fish And Seafood Exporting Countries - WorldAtlas," World Data Atlas, 2020, https://www.worldatlas.com/articles/top-fish-and-seafood-exporting-countries.html.

[321] Homi Kharas and Kristofer Hamel, "A Global Tipping Point: Half the World Is Now Middle Class or Wealthier," Brooking eudcation, 2018, https://www.brookings.edu/blog/future-development/2018/09/27/a-global-tipping-point-half-the-world-is-now-middle-class-or-wealthier/.

The global Middle-class population increased from 899 million to 1.6 billion. It is estimated that the middle Class population will reach 4 billion in 2021, and 5.3 billion in 2030, while the world population will be 8.6 billion in 2030. It means that more than 60 percent of the world population will be middle class, and it will reach 3.4 million in 2030. Among the people who got the new status of the Middle class, 90 percent are in Asia. Majority of IOR countries are in Asia. It means that increasing the Middle Class will have an impact on demand for protein rich food. Poverty is gradually declining in IOR. India is the most populated country in IOR. It has a population of 1.3 billion people. People in India witnessed a significant decline in poverty. [322]

According to World Bank data, in 2011, 21 percent of the population was living below the line of poverty, which has declined to 10 percent in 2019.[323] The second most populated country in IOR is Indonesia; poverty in Indonesia is also decreasing. In 2010, the rate of poverty in Indonesia was 13.5 percent, which has declined to 9.8 percent in 2018. Pakistan is the third most populated country in IOR. In 2010, 36 percent people were living below the global line of poverty, which declined to 24 percent in 2015. All these statistics are showing that poverty is decreasing in the world, which will eventually increase the demand for fisheries and seafood. The decline of poverty is not just limited to IOR. [324]

In the past 10 years, 900 million people came out of poverty. It will have a significant impact on demand for protein rich food. We will witness increasing demand for fisheries and seafood in many IOR countries such Bangladesh.[325] In 2011, per capita consumption of fisheries and seafood was 19 kg, which reached 24 kg in 2018. In the past seven years, it witnessed a 5 kg increase in consumption of fisheries and seafood resources. [326]

In the same way, Indonesia also witnessed an increase in the consumption of fisheries and seafood. In 2010, per capita consumption of fisheries and seafood was 27 kg in Indonesia, which reached 44 kg in 2017. In the past 7 years, the per capita consumption of fisheries and seafood witnessed an increase of 17 kg. It shows that with a growing population and increasing middle class the

[322] John Kearney, "Food Consumption Trends and Drivers," *Philosophical Transactions of the Royal Society B: Biological Sciences* 365, no. 1554 (2010): 2793–2807, https://doi.org/10.1098/rstb.2010.0149.
[323] world Bank, "Poverty | Data," WORLD BANK WebSite, 2021, https://data.worldbank.org/topic/poverty.
[324] Bank.
[325] Jeffrey Sachs, "The End of Poverty_ How We Can Make It Happen in Our Lifetime-Penguin (2011)" (London: Penguin Group, 2018).
[326] Md Naimur Rahman and Abu Reza Md Towfiqul Islam, "Consumer Fish Consumption Preferences and Contributing Factors: Empirical Evidence from Rangpur City Corporation, Bangladesh," *Heliyon* 6, no. 12 (2020): 0–7, https://doi.org/10.1016/j.heliyon.2020.e05864.

demand for protein rich food will increase.[327] The increase in per capita consumption was just not limited to these countries. Overall demand for fisheries and seafood has increased. According to FAO, in 2018, per capita consumption reached 20 kg which is expected to reach 21 kg in 2030. According to the report of FAO in 2020, it predicted that there is a possibility of shortage of protein rich food in the world. The obvious consequence of growing demand will be overfishing. [328]

3.2 Overfishing

Fisheries and seafood plays an important role in providing food security to people. As described above, the trend in population growth and middle class will increase the demand for fisheries and seafood. The problem of overfishing didn't exist until human beings started using technology and they started to catch fisheries on industrial level on the mass level. Technology helped human beings to export it to other countries, and the result of it was overfishing. When fishers or vessels start catching more fisheries and seafood, and as result, stocks don't recover, it is called overfishing. [329]

Overfishing imparts a negative impact on oceans and food security. According to FAO, 90 percent of stocks are used up. It means that growing demand can seriously damage fisheries and seafood resources.[330] The world has become global villages and due to globalization the world is connected. Fisheries and seafood captured in IOR can become part of the food chain in Europe or America; hence, depletion of stock in any ocean can be adverse for fisheries and seafood stocks in other regions of the world as well. Because, it will increase the demand for fisheries and seafood, which will be met through catching more fisheries and seafood. [331]

According to FAO, in 1974 around 35 percent of fisheries and seafood stock was under-fished, which has declined to 5 percent in 2017, while in 1974, 90 percent of fisheries and seafood stock

[327] Firmansyah et al., "Indonesian Fish Consumption: An Analysis of Dynamic Panel Regression Model," *IOP Conference Series: Earth and Environmental Science* 246, no. 1 (2019): 8–12, https://doi.org/10.1088/1755-1315/246/1/012005.

[328] FAO, *The State of World Fisheries and Aquaculture 2020. Sustainability in Action.*

[329] Gil Rilov, Ohad Peleg, and Tamar Guy-Haim, *The Restructuring of Levant Reefs by Aliens, Ocean Warming and Overfishing*, ed. Gil Rilov, Ohad Peleg, and Tamar Guy-Haim, *Interactions in the Marine Benthos*, 1st ed. (London: Cambridge University Press, 2019), https://doi.org/10.1017/9781108235792.010.

[330] Segio Rossi, *Oceans In Decline*, 1st ed. (Barcelona: Springer, 2019), http://www.investindustrial.com/our-business/portfolio-overview/current-portfolio/Sergio-Rossi.html.

[331] Rossi.

was biologically sustainable, which has declined to 65 percent in 2017. The percentage of biologically unsustainable stock is increasing as well. [332]

The percentage of biologically sustainable stocks in the western and eastern Indian Ocean is around 70 percent, while 30 percent stock is at a biologically unsustainable level. It means that majority stocks in the Indian Ocean are at sustainable level and those stocks which are not biologically sustainable can be saved; however, the temporary landings of fisheries and seafood from both regions of Indian Ocean region is increasing which can impact fisheries and seafood stock in IOR. [333]

There are countries in IOR where the problem of overfishing is extremely palpable. Bangladesh is among those countries. A report about the situation of fisheries and seafood in the Bay of Bengal highlighted a worrisome trend. According to the report, the majority of species in the Bay of Bengal are declining and some species can become extinct.[334] Species of tiger prawns and Salmon which were highly valuable has completely vanished. The reason behind the overfishing is industrial level fishing. Number of trawlers has increased in Bangladesh, and they have many times greater capacity than artisanal boats. There are estimated 270 trawlers off the coast of Bangladesh, and in one trip, a trawler can catch 400 tonnes of fisheries and seafood. The arrival of super trawlers has increased the capacity of fisheries and seafood. [335]

Malaysia heavily depends on fisheries and seafood resources to provide food security to people. Overfishing is also creating challenges for people in Malaysia as well. According to survey of the Malaysian government, which was carried out in 2016, demersal fish stock of the country witnessed 88 percent reduction in stock.[336]The fisheries department, in 2019, shockingly revealed that its 90 percent fish stock has reached final limits due to overfishing. According to the report,

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[332] FAO, *The State of World Fisheries and Aquaculture 2020. Sustainability in Action.*

[333] FAO.

[334] Samsul Mannan et al., "Enabling Stakeholder Participation in Marine Spatial Planning: The Bangladesh Experience," *Journal of the Indian Ocean Region* 16, no. 3 (2020): 268–91, https://doi.org/10.1080/19480881.2020.1825200.

[335] Md Abdullah Al-Mamun et al., "Stock Assessment for Seven Fish Species Using the Lbb Method from the Northeastern Tip of the Bay of Bengal, Bangladesh," *Sustainability (Switzerland)* 13, no. 3 (2021): 1–11, https://doi.org/10.3390/su13031561.

[336] Xinjun Chen and Yinqi Zhou, *Brief Introduction to Fisheries*, *Brief Introduction to Fisheries*, 2020, https://doi.org/10.1007/978-981-15-3336-5.

the main reasons behind the overexploitation of stocks were: modern equipment, trawlers, subsidy, and poor management.[337]

Egypt is another country which is facing the problem of overfishing. Egypt gets 35 percent of fisheries and seafood catch from the ocean. The Egypt Environmental Agency warned that Egypt can face economic and environmental disaster if overfishing didn't stop. Egypt took steps to stop overfishing, but these were not enough. [338]In 2009, Hurghada Declaration was signed to prevent overfishing in Red sea; however, according to professor who helped in framing declaration said that, "He went on to explain that an average of 20,000 tons of fish is caught each year in the sea, far surpassing the recommended sustainable limit of between 900 and 1,500 tons". [339]

It shows that controlling overfishing is a difficult task even within the territorial limits of a country. It is also underlining the challenges for regional governance and international governance to control undesirable practices while catching fisheries and seafood. The share of fisheries and seafood in the overall production is minute, still, controlling overfishing remains a challenge, because national level statistics related to fisheries and seafood masks the importance of these resources for coastal communities and people who depend on these resources for food security and employment. These people don't have any other alternative; therefore, they don't follow regulations from the government.

Overfishing has a grave impact on diversity. According to one study in Egypt, from 2002 to 2006 there were 16 species of sea cucumber in the red sea, which declined to 7 species in 2016. The Egyptian authorities banned catch of sea cucumbers, but it didn't stop over exploitation. Sea cucumber population is facing threats all around the world. Overexploitation has damaged its population so much that some experts believe that it required a half of century ban on exploitation for restoring its population.[340] Overfishing can cause different environmental, social, political, and economic challenges. Ecosystem works on a delicate balance where all species play a vital role in maintaining the delicate equilibrium. Overexploitation of one species can start a chain reaction

[337] Paul Robbins, "Marine Science," *Encyclopedia of Environment and Society* 71 (2014): 183–94, https://doi.org/10.4135/9781412953924.n678.

[338] Mohamed Samy-Kamal, "Status of Fisheries in Egypt: Reflections on Past Trends and Management Challenges," *Reviews in Fish Biology and Fisheries* 25, no. 4 (2015): 631–49, https://doi.org/10.1007/s11160-015-9404-z.

[339] Samy-Kamal.

[340] Mohamed Samy-Kamal, "Outlook on the Fisheries Policy Reform in Egypt and the Draft of the New Fisheries Law," *Marine Policy* 120, no. March (2020): 104136, https://doi.org/10.1016/j.marpol.2020.104136.

that can damage the food chain and ecosystem that can have disastrous impact on the oceanic environment.[341]

Overfishing can lead to multiple problems. Some of these problems are as follow:

(i) As a direct result of overfishing leads towards increased mortality rate among species, which are target and those species which become by catch.

(ii) It decreases the prey population in a great way.

(iii) It decreases population of predators

(iv) Overfishing can lead towards changes in habitat of fisheries and seafood resources

Overfishing seafood and fisheries resources can have serious implications for biodiversity of fisheries and seafood resources. [342]

(i) Changes in Community structure of fisheries and seafood

(ii) It can decrease abundance in fisheries and seafood species

(iii) Overfishing in certain areas can completely obliterate species from that area. A species of fisheries and seafood can completely disappear from a certain area. [343]

It can have consequences for people, cultures, and countries dependent on the Ocean for survival. Therefore, it can start competition between people who depend on the ocean for fisheries and seafood. It can then lead towards conflict as well. Another problem which is linked with overfishing is the illegal fishing, by national and international actors, which can have a negative impact on competition among countries for fisheries and seafood resources. [344]

3.3 Illegal and Unregulated and unreported Fisheries:

According to the FAO, illegal fisheries pose the gargantuan challenge to sustainable fisheries and seafood resources in the World. Illegal fisheries is defined by International Plan of Action to Deter and Eliminate, Unregulated and Unreported fishing in this way:[345]

There are three element of illegal fishing in the definition which are:

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[341] Samy-Kamal.

[342] Jessica H. Jönsson, "Overfishing, Social Problems, and Ecosocial Sustainability in Senegalese Fishing Communities," *Journal of Community Practice* 27, no. 3–4 (2019): 213–30, https://doi.org/10.1080/10705422.2019.1660290.

[343] J. Samuel Barkin and Elizabeth R. DeSombre, *Saving Global Fisheries: Reducing Fishing Capacity to Promote Sustainability*, ed. J. Samuel Barkin and Elizabeth R. DeSombre, *Paper Knowledge . Toward a Media History of Documents*, 1st ed. (Washigton, DC: MIT Press, 2013).

[344] Barkin and DeSombre.

[345] Barkin and DeSombre.

(i) Performing fisheries and seafood activities in waters which come under authority of state by local and international vessels without permission of the state and breaking laws of that state.

(ii) Fishing activities by fishing boats using the flag of states that are parties to regional fisheries management organizations and performing actions that are against the rules and regulations of that state.

(iii) Fishing activities that violate national and international law, treaties, and obligations, which are ratified by the state or regional fisheries management organization. [346]

Unreported fisheries and seafood activities can be defined as:

(i) No reporting and misreporting of catch to relevant authorities in violation of national laws and regulation

(ii) Performing fishing activities in the area under the authority of RFMO and not following reporting process design by relevant RFMO.

Unregulated fisheries and seafood activities can be defined as:

(i) Performing fishing activities in the area of RFMO by fishing vessel of a country without nationality and fishing in an area of RFMO using the flag of a state that is not a member of the concerned RFMO. Moreover, performing fishing activities in a way that is not in line with the rules and regulations set by RFMO and concerned state.

(ii) Performing fishing activities in an area where there are rules and regulations; performing fishing activities in a way that goes against the conservation guidelines given by international law. [347]

All three definitions point towards international law and regional fisheries management of fisheries resources. It is evident from these definitions that fisheries and seafood issues have close connections with international relations. They are not limited to the jurisdiction of a state, but it is a matter of regional and international concern. Apart from these definitions, FAO also highlights three main types of illegal fisheries and seafood. [348]

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[346] Mars B. Gabbasov, Nurbolat Zh Jaichibekov, and Daniel V. Lebedev, "A Mathematical Model of Biological Resource Dynamics, Using Caspian/Ural Sturgeon as a Case Study," *ICES Journal of Marine Science* 65, no. 1 (2008): 103–10, https://doi.org/10.1093/icesjms/fsm174.

[347] D. G. Webster, *Beyond the Tragedy in Global Fisheries*, ed. D. G. Webster, 1st ed. (London: MIT Press, 2015).

[348] Webster.

There are three main categories of illegal fisheries and seafood, according to FAO. The first type of illegal fisheries is when foreign vessels exploit the water of another state without the permission of that state. A palpable example of this type of illegal fisheries happens in the WIOR. These countries don't have considerable resources, security agencies and governance mechanisms to restrain other regional and international vessels to stop illegal fisheries and seafood. The second type of illegal fisheries and seafood catch discusses those activities where fishing vessels don't report or miss report fishing activities. Some fishing vessels catch more fisheries and seafood then their set quota.[349] The third type of illegal fisheries is: fishing activities in those areas where there are no effective mechanisms to regulate fishing activities. The term can also be used for catching those species which are facing the threat of extinction, migratory species, and using fishing equipment which can damage the environment and biodiversity. Although this type of fishing and seafood catch is not illegal under national laws, because these activities happen at high sea, it can create lots of predicament for fisheries and seafood resources, because the oceanic environment is highly connected.[350] In some cases, overexploitation at high seas can damage fisheries and seafood resources in the territorial waters of a country.

According to the FAO, the most common type of illegal fishing activity is use of illegal gear, not following seasonal restrictions, catching small size species, and catching fisheries and seafood from marine protected areas. Illegal fisheries occur at territorial sea as well as in international waters. According to estimates of FAO, the share of illegal fisheries is around 26 million tonnes every year; it's worth around 10 to 26 billion dollars. However, there is disagreement among experts related to real estimates of illegal catch of fisheries and seafood.

According to Illegal, Unreported and Unregulated Watch, illegal and unregulated fish catch represent 13 to 31 percent of overall production and in some areas, it represent 40 percent share of overall production. It has a huge impact on some of the world poorest nation. It damages ecosystem, employment opportunities, food security, and the economy of the poorest and developing nations.[351] In the West African region, it is responsible for the loss of 1.3 billion dollars.

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[349] Olav Schram Stokke and Sebastian Oberthür, *Introduction: Institutional Interaction in Global Environmental Change*, *Managing Institutional Complexity: Regime Interplay and Global Environmental Change*, 2011, https://doi.org/10.7551/mitpress/8577.003.0004.

[350] Stokke and Oberthür.

[351] Peter Stoett and Delon Alain Omrow, *Spheres of Transnational Ecoviolence*, *Spheres of Transnational Ecoviolence*, 1st ed. (Ontario: PALGRAVE MACMILLAN, 2021), https://doi.org/10.1007/978-3-030-58561-7.

Therefore, it can lead towards other problems which can engender national security problems for these small and poor countries; furthermore, these countries don't have resources to curb illegal and unregulated fisheries activities in their territorial waters. [352]

Foreign Fishing vessels illegally exploit fisheries and seafood resources of IOR. The first example of illegal fisheries and seafood in IOR is Somalia. Somalia is a small and unstable country in the WIOR. It has a small fishing sector and a weak governance structure. Due to this reason, foreign fishing vessels exploit fisheries and seafood resources from territorial waters of Somalia. Foreign fishing vessels not only exploit resources but also pose a direct physical threat to artisanal fishers of Somalia.[353] Fishing vessels of many other countries compete with each other in bid to obtain maximum resources, as a result, wreak havoc on the environment. They don't regard any fisheries laws and regulations. Somalia is among those places where all three types of illegal fisheries and seafood activities are common.

Numerous regional and international vessels fish in its waters; they used illegal gear; and there is no effective regulation mechanism to stop these fishing vessels from fishing in its waters. All three types of illegal fishing will have a serious impact on fishing in Somali waters. Somalia is among one the poorest countries in the world. Fisheries and seafood can become a valuable resource to end malnutrition among children, alleviating people from poverty, and making it a peaceful [354]country; however, illegal fishing activities— of foreign fishing vessels— are taking away the future and hope from poor Somali people.

In Somalia, activities of foreign fishing vessels have increased. There are 20 times more foreign fishing vessels fishing in Somali waters. Increase in foreign vessels started happening after 1990 when due to civil war and collapse of the federal government governance mechanism collapsed. It created a vacuum; foreign fishing saw it as an opportunity, and they started exploiting fisheries and seafood resources from Somali waters. According to a study, foreign fishing vessels caught 92500 MT of fisheries and seafood from Somali water in 2014. The share of Iran and Yemen was 48 and 31 percent respectively. [355]

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[352] Stoett and Omrow.

[353] Stoett and Omrow.

[354] Tim Cashion et al., "Fisheries in Somali Waters: Reconstruction of Domestic and Foreign Catches for 1950–2015," *Marine Policy* 87, no. November 2017 (2018): 275–83, https://doi.org/10.1016/j.marpol.2017.10.025.

[355] Cashion et al.

Trawlers are also illegally exploiting fisheries and seafood resources in Somali waters. Their share of catch is only 6 percent out of total catch.[356] In 2014, the trawled 240000 km square kilometer seabed. It can have an adverse impact on the fisheries and seafood resources of Somalia. Illegal fishing activities generate challenges for livelihood and food security in the long term.[357]

Illegal fishing is just not happening in Somali water. It is also happening in the Persian Gulf. Apart from Somalia, unregulated fishing activities are also increasing in the Indian Ocean. According to the report of WWF, the world is more focused on illegal and unreported fisheries and seafood, while unregulated mechanisms are growing in IOR. According to the report, squid fishing is just one area where unregulated fishing is increasing with great speed. In the last 5 years, it witnessed a rise of 830 percent. [358]This increase is happening because of flaws in regulatory mechanisms. High seas of the Indian Ocean are not fully covered under regional governing mechanisms.

The problem of illegal fishing also persists in the Gulf of Thailand. Fisheries and Seafood resources were considered common property in Thailand. Citizens of Thailand could obtain fisheries and seafood from the waters of Thailand. Illegal fisheries remained a constant challenge in Thailand due to its importance in countries' economies.[359] Thai authorities remained reluctant to take action against IIU fishing. Thailand has one the largest commercial fleets in the world. It has more than 10000 commercial vessels, and it has processing facilities for 25 percent of Tuna catch. In 2015, the European Commission gave Yellow card to Thailand, because it was not sufficiently cooperating to fight against illegal fishing. Thai commercial fishing vessels adopted a practice to disregard fishing regulation. [360]

Thailand is famous for importing and exporting seafood and fisheries resources. Overexploitation of fisheries led to decline in fishing stock in Gulf of Thailand; therefore, the government introduced many steps to stop overexploitation of fisheries resources in Thailand. Some of these limitations were: Putting a limit on mesh size, declaration of closed areas, and specifying seasons for recovery of the stock. These limits were unable to put a moratorium on illegal fishing because of

[356] U. Rashid Sumaila and Mahamudu Bawumia, "Fisheries, Ecosystem Justice and Piracy: A Case Study of Somalia," *Fisheries Research* 157 (2014): 154–63, https://doi.org/10.1016/j.fishres.2014.04.009.

[357] Cashion et al., "Fisheries in Somali Waters: Reconstruction of Domestic and Foreign Catches for 1950–2015."

[358] WWF, "Unregulated Fishing on the High Seas of the Indian Ocean: The Impacts on, Risks to, and Challenges for Sustainable Fishing and Ocean Health" (Bonn, 2020).

[359] Ines D. Lange, Eike Schoenig, and Somkiat Khokiattiwong, *Thailand, World Seas: An Environmental Evaluation Volume II: The Indian Ocean to the Pacific*, Second Edi (Elsevier Ltd., 2018), https://doi.org/10.1016/B978-0-08-100853-9.00030-0.

[360] Lange, Schoenig, and Khokiattiwong.

management issues.[361] They remained in the ocean for months, because they had a network of fishing vessels and processing units to support them. Due to lack of regulations, Thai fisheries and seafood stocks depleted to unsustainable levels. These fishing vessels also encroached on fishing stocks of other neighboring countries such as Myanmar, Malaysia, Indonesia and Cambodia. They were using fishing gear like foldable fish or shrimp traps and set bag nets that completely decimated the fishing population. [362]These fishing tools are illegal under 2015 fisheries regulations. Due to these practices fishing stocks depleted, and they started catching trash fisheries. It led to further decline in fisheries and seafood stocks, because they were catching small fisheries, and as result, fishing stocks were unable to recover.

Thailand was one example of how illegal fishing decimated fisheries and seafood stock then it led Thai fishing vessels towards waters of neighboring countries. It shows that illegal fishing can lead countries towards competition for fisheries and seafood resources; furthermore, these practices can have an adverse impact on fishing stocks of other countries as well. Indonesia, Malaysia, and Myanmar are countries of IOR and these countries highly depend on fisheries and seafood resources for providing food security to their people.[363] These countries are among countries where per capita consumption of fisheries and seafood is high; they get more than 30 percent of their animal protein from fisheries and seafood. According to WWF, Malaysia, Indonesia, and Myanmar's dependence on fisheries and seafood resources is high as shown in chapter 2. Illegal and unregulated fisheries in the Gulf of Thailand is a prime example of how illegal fishing can drive countries towards competition for fisheries and seafood resources. [364]

Some valuable species are becoming the favorite prey of illegal fisheries activities in IOR. Tuna is one of those species, it is precious and demand is increasing in International market. There are concerns that it might become extinct. In the past 60 years, Tuna catch witnessed a 1000 percent rise, due to this reason scientists showed concerns that it won't be able to sustain growing demand. Every year, 6 million tonnes of Tuna become a part of the food market. [365]

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[361] Lange, Schoenig, and Khokiattiwong.

[362] Lange, Schoenig, and Khokiattiwong.

[363] Ted L. McDorman and Panat Tasneeyanond, "Increasing Problems for Thailand's Fisheries. Malaysia's New Fisheries Law," *Marine Policy* 11, no. 3 (1987): 205–16, https://doi.org/10.1016/0308-597X(87)90057-1.

[364] McDorman and Tasneeyanond.

[365] Mahdi Parsa et al., "An Empirical Bayesian Approach for Estimating Fleet-and Vessel-Level Bycatch Rates in Fisheries with Effort Heterogeneity and Limited Data: A Prospective Tool for Measuring Bycatch Mitigation Performance," *ICES Journal of Marine Science* 77, no. 3 (2020): 921–29, https://doi.org/10.1093/icesjms/fsaa020.

Pakistan is another country where illegal fishing on Tuna is happening. Fisherman in Pakistan are using drift nets to catch Tuna, as result, they catch non- target species as well. It impact bi diversity and food chain of many species. Usually these boats catch fisheries and seafood in exclusive economic zone of Pakistan; however, according to the report of WWF, these boats can also be seen in high seas as well. Pakistan is party to international convention that stops use of driftnet, but it is not taking action against fishermen. These fishing practice will have worse impact for food chain of Pakistan as well as of the whole IOR.[366]

According to the report of WWF, Squid is another species which is under threat due unregulated, unreported and illegal fishing. In the last five years, IIU squid witnessed an increase of 830 percent. IIU fishing can damage the food chain in a great way. Squid play an important role in fishing of Tuna. Increasing catch of squid can destroy an important component of Tuna's food chain. [367]

3.4 Impact of Illegal, unregulated and Unreported Fisheries

IUU pose a grave danger to biodiversity and ecosystem. It exacerbates the risk of depletion of sea resources, which will impact the food security of billions of people. This will lead countries towards competition and conflict. Firstly, undertaken research discusses impact of unreported fisheries. According to the biodiversity report of the UN, 60 percent of fisheries and seafood resources have reached the maximum sustainable limit of exploitation; furthermore, 33 percent have gone beyond these limits. The first issue which can arise from unreported fisheries and seafood is that it can lead to miscalculation of fisheries and seafood resources. Policy making depends on data which is obtained through reported fisheries and seafood. If policy makers will not have correct data then they can't make rational decisions. Therefore, under reporting fisheries and seafood catch leads toward wrong policies; it can create predicaments for management of fisheries and seafood resources.

[366] Saira Moinuddin, "A Brief Analysis of Coastal Policies and Practices for the Project Tackling Poverty in Pakistan ' s Coastal Communities through the Sustainable Coastal Livelihood Project Report by : Saira Moinuddin , Research Intern" (Karachi, 2004).
[367] Moinuddin.

3.5 Climate Change and pollution

Climate change will impact fisheries and seafood resources in a great manner. There are legitimate concerns about climate change in communities and people who depend on ocean resources for food security. [368]

Climate change will not only affect the marine ecosystem but also play a negative role in the overall production of food. It will enhance the chances of competition among countries. Climate change can be defined as: It is variations in temperature and weather of a region for a longer period of time. Due to human activities greenhouse gases are entering into the atmosphere. Every year humans release approximately 51 billion tonnes of greenhouse gases into the atmosphere. Sun is an important source of energy for human beings, and the sun rays give energy to earth and when they reflect back to space greenhouse gases trap these rays, and as a result, the temperature of the earth is rising significantly. [369]

According to the report, the Indian Ocean temperature witnessed an increase of 1 degree Celsius every year from 1951- 2015. The Indian Ocean temperature rose 0.3 degree Celsius more than the average world temperature; furthermore, heat content also witnessed an increase in 700 m tropical sea. Temperature rise of 2.4 Celsius is expected till 2040, and temperature rise of 4 degree Celsius is expected till end of this century. [370] Rise of temperature will have adverse impact for fisheries and seafood in IOR. All the Oceans in the world play an important role in sinking heat. But the capability of sinking heat is different among the ocean. For example, during the time period of 2003 to 2007, heat content of the Pacific Ocean declined despite an increase in heat taken from the surface.

In Contrast to the Pacific Ocean, the heat content of the Indian Ocean has increased.[371] The Pacific Ocean waters flow into the Indian Ocean near Indonesia; therefore, it increased the temperature of

[368] Grant R. Bigg, *The Ocean and Climatic Change*, *The Oceans and Climate, Second Edition*, 2nd ed. (London: Cambridge, 2012), https://doi.org/10.1017/cbo9781139165013.008.
[369] Bigg.
[370] Victor R. Savage and Lin Qi Feng, "Climate Change Adaptation: The Need for an Indian Ocean Regional Metamorphosis," *Journal of the Indian Ocean Region* 16, no. 1 (2020): 6–26, https://doi.org/10.1080/19480881.2020.1682749.
[371] Savage and Qi Feng.

the Indian Ocean quickly.[372] Heat from the Pacific Ocean also absorbs into the Indian and then it moves to the Atlantic Ocean.

Plankton in the Ocean has a basic role to support the food web. Fisheries and seafood depend on plankton for their survival. Plankton helps to stabilize the food chain in the Ocean as a primary component of the Ocean food chain. According to a study, the western tropical Indian Ocean is warming faster than any other region of the Ocean. Due to its high temperature, the global average sea temperature is also increasing. From 1901-2012, the eastern Indian Ocean witnessed a temperature rise of 0.78 Celsius, while during the same time period, the western Indian Ocean witnessed a temperature rise of 1.28 Celsius. [373]

According to different climate change simulations for tropical regions, the temperature in the west will increase, decrease in the east; furthermore, the east will also witness decline in walker cell and shoaling thermocline. Other IOR simulation also shows an increased dissolved subsurface oxygen level in WIO and decline in the Eastern and central IO.[374]

Consequence of this temperature rise is — the Ocean stratification. Ocean stratification happens when water which has different properties like: different amounts of salt dissolved in water, density, and due to difference in temperature in layers of waters doesn't mix. This trend increases due to high temperatures. The temperature of the western Indian Ocean region is high as compared to the Eastern Indian Ocean, as a result, the Ocean Stratification is happening rapidly in the Western Indian Ocean; thus, it decreases the amount of nutrients mixing from subsurface layers. In the summer, phytoplankton concentration used to increase in the WIOR, which has decreased 20 percent in the past 60 years due to increase in the temperature of the ocean.[375]

Phytoplankton, microscopic marine algae, are the basic component of many aquatic food chains. Many aquatic animals use these Phytoplankton as their food and then many other fisheries and seafood use these animals as sources of their own food. In this way, the oceanic food chain is maintained. These phytoplankton use nutrients from the surface as their food, but due to the Ocean

[372] R. Krishnan et al., *Correction to: Assessment of Climate Change over the Indian Region*, *Assessment of Climate Change over the Indian Region*, 2021, https://doi.org/10.1007/978-981-15-4327-2_13.
[373] Krishnan et al.
[374] R. Krishnan et al., "Assessment of Climate Change over the Indian Region: A Report of the Ministry of Earth Sciences (MOES), Government of India," in *Assessment of Climate Change over the Indian Region: A Report of the Ministry of Earth Sciences (MoES), Government of India* (Springer Singapore, 2020), 1–226, https://doi.org/10.1007/978-981-15-4327-2.
[375] Krishnan et al.

Stratification nutrients don't mix with the subsurface layer where these phytoplankton exist. As a result of this phenomena, the population of phytoplankton is decreasing eventually which impacts the food web of aquatic animals. [376]

The WIO consists of 9 countries which are Comoros, Tanzania, Madagascar, Mauritius, South Africa, Seychelles, Somalia, Kenya, and Mozambique. Among these 9 countries, 6 countries are among Low income food deficit countries, and the level of hunger in four countries is serious; furthermore, the level of hunger in one country is alarming and in the one country level of hunger is moderate. The dependence of these countries on fisheries and seafood is medium and medium-high. [377] It shows that fisheries and seafood resources can play an important role in providing food security to the people of the IOR. These countries will face more impact of climate change, especially coastal communities of these regions will be further impacted by climate change; therefore, it can increase the probability of competition for fisheries and seafood resources in the Indian Ocean region. [378]

Oceans not only provide us food and livelihood, but also play a role in absorbing carbon dioxide. In 2019, global atmospheric carbon dioxide was 409 ppm. Warming and acidification of Ocean can have serious implications for the food chain in the Ocean. Coral reefs play a necessary role in the food chain of fisheries and seafood. However, there are concerns that Coral reefs might not be able to sustain 450 ppm or greater concentration of carbon dioxide in the atmosphere.[379]

Increased acidification of the Ocean also decreases oxygen in the ocean. It also impacts the physical and chemical structure of fisheries and seafood. Temperature also impacts the physical and chemical structure of fisheries and seafood. It also impacts on body size and success of reproduction. All these factors show that temperature plays a significant role in the growth of fisheries and seafood resources. [380]

The chemistry of seawater is changing because carbon dioxide emitting from the human activities is becoming part of the Oceans. It will have serious implications for the ecosystem and food web in the upper oceans, because due to absorption of carbon dioxide, water is becoming acidic. With

[376] Krishnan et al.
[377] Sarah F.W. Taylor et al., "Measurement and Implications of Marine Food Security in the Western Indian Ocean: An Impending Crisis?," *Food Security* 11, no. 6 (2019): 1395–1415, https://doi.org/10.1007/s12571-019-00971-6.
[378] Taylor et al.
[379] Techera, "Supporting Blue Economy Agenda: Fisheries, Food Security and Climate Change in the Indian Ocean."
[380] Techera.

the increase of carbon dioxide in the atmosphere as result of human activates, the level of the ocean acidification is increasing well. The value of PH is moving towards acidic nature. If we compare with pre industrial era then PH level of the Indian Ocean waters has declined 0.1 unit. The acidification is more evident in the WIOR.

Due to increase acidification of water, reef buildings coral have destroyed.[381] The impact of this acidification is more visible in the Western Arabian Sea as compared to other Tropical Ocean Basin, because strong upwelling takes Carbon dioxide away from the region. Carbon dioxide's properties allow it to absorb heat. It has an endothermic nature; therefore has the ability to absorb a large quantity of heat. Combining effects of acidification and the endothermic nature of Carbon Dioxide the Sea Surface Temperature (SST) is increasing. [382]

According to simulation of the ocean biogeochemical model, acidification of the Western Arabian Sea has increased 108 percent because of inorganic carbon; furthermore, due to alkalinity, it's shown a -36 percent decrease in buffering ability. 16 percent due to surface warming, 6 percent acidification happened due to mixture salt in the water, and some acidification happened due to ions present in the water.[383] The Western Arabian Sea plays a highly effective role in the production of fisheries and seafood; therefore, it is imperative to monitor the level of acidification in it. [384]

Acidification of the Ocean water can have a negative impact on production of fisheries and seafood. The UN environmental protection agency also warned about the serious consequences of Ocean acidification on the production of fisheries and seafood. According to the United National Environmental Agency the world Ocean can become 150 times more acidic by the end of the century; however, some seas like the western Arabian Sea have already become 108 percent more acidic. The production of fisheries and seafood becomes difficult, because shells of some animals

[381] Siddharth Shekhar Yadav and Kristina Maria Gjerde, "The Ocean, Climate Change and Resilience: Making Ocean Areas beyond National Jurisdiction More Resilient to Climate Change and Other Anthropogenic Activities," *Marine Policy* 122, no. August (2020): 104184, https://doi.org/10.1016/j.marpol.2020.104184.
[382] Yadav and Gjerde.
[383] Thomas Wernberg et al., "Impacts of Climate Change in a Global Hotspot for Temperate Marine Biodiversity and Ocean Warming," *Journal of Experimental Marine Biology and Ecology* 400, no. 1–2 (2011): 7–16, https://doi.org/10.1016/j.jembe.2011.02.021.
[384] Wernberg et al.

are made of calcium carbonate such as, Oysters, Coral, Plankton, and shellfish.[385] Due to increased acidification of the ocean water shell of these animals can't grow back and acid will dissolve them. The acidification of the ocean is also dangerous for petro pods. These small creatures play an important role in the food chain of important species like herring Salmon, Whales and Seabirds. [386]

Coral reefs are also facing threat from the acidification of the Ocean. According to the estimates of the International Reef Initiative Forum, they provide a benefit of around 12 billion dollars from fisheries and tourism in the IOR and South – East Asia. In the Indian Ocean, Coral reefs are under immense stress due to multiple factors such as pollution, sediments, overfishing, global warming and the Ocean acidification.[387] About 25 percent of the reef in the world has been demolished due to these factors. With the mass bleaching event in 2016 and 17 coral reefs are under increasing pressure and there is a great chance that the temperature has reached more than their resistance ability. The result in the Lab also showed that abundance of carbon supply can increase the number of harmful creatures for the reefs. [388]

There are countries in the IOR which heavily depend on coral reefs for food security. Indonesia is one of those countries. According to the WWF, the dependence of Indonesia on fisheries and seafood is high. Despite the high importance of coral reefs in its economy, it lacks the data on how increase in temperature and acidification of the ocean will impact its economy.

The acidification of the Ocean is also becoming a threat to the farm fishing in the Indian Ocean. Asia and the IOR is the biggest producer of the fisheries and seafood. But there are concerns about marine farming in the acidic water, and there is increasing danger that fisheries and seafood species might not be able to survive in the increasing oceanic waters. [389]

There is another concern which is rising due to climate change: the decreasing level of oxygen in the sea water due to climate change. Oxygen is necessary for all living organisms on the earth. The

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[385] Michael B. Gerrard and Gregory E. Wannier, *Threatened Island Nations: Legal Implications of Rising Seas and a Changing Climate*, *Threatened Island Nations: Legal Implications of Rising Seas and a Changing Climate*, 2009, https://doi.org/10.1017/CBO9781139198776.

[386] Gerrard and Wannier.

[387] Joseph F. C. DiMento and Pamela Doughman, *Climate Change What It Means for Us, Our Children, and Our Grandchildren*, ed. Joseph F. C. DiMento and Pamela Doughman, 1st ed. (London: MIT Press, 2007).

[388] DiMento and Doughman.

[389] James J Heckman, Rodrigo Pinto, and Peter A. Savelyev, *CLIMATE CHANGE AND OCEAN GOVERNANCE Politics and Policy for Threatened Seas*, ed. PAUL G. HARRIS, 1st ed. (London: Cambridge University Press, 2019).

Indian Oceans have more Oxygen minimum zones than any other Ocean in the world. These Oxygen minimum zones are found in some of the most important fishing areas like, Bay of Bengal and Arabian Sea. With these Oxygen minimum zones, the level of dissolved Oxygen is decreasing in the IOR.[390] In the past 50 years, the level of oxygen witnessed a decline at the rate of **0.1**–0.3 μ mol kg^{-1} $year^{-1,}$ and the declining level of Oxygen can have adverse impact for fisheries and seafood resources in the IOR. Long term prospect of the level of Oxygen are also painting a dismal picture, because in the Tropical Ocean the level of Oxygen showed a significant decline of 20–30 mol m^{-2} per decade. [391]

The consequences of low concentration have started emerging in different parts of the Indian Ocean Region. In the Arabian Sea, due to the low concentration of oxygen, Noctiluca scintillans appeared in. This phenomenon wasn't common in this part of the Indian Ocean but due to the impact of Climate change, the level of Oxygen is decreasing; thus, these dead zones are forming. It had a severely negative impact on fisheries and seafood fisheries species present in the region. [392]

There are two types of dead zones: one type of dead zone occurs naturally in the Ocean because of inefficient mixing of the Ocean water, and the second type of dead zone is formed due to climate change.

Seasonal Dead zones are the result of the Monsoon winds. In the Monsoon season strong wind brings up the nutrient- rich waters upwards, and as a result, Phytoplankton and Photosynthetic organisms grow in large numbers. This plays an important role in sustaining the food chain of the Ocean's species. Without Phytoplankton, the food chain in the ocean can't survive. Due to the climate change, the temperature of the land is increasing and snow on the mountains is melting rapidly, which is increasing the temperature, as a result, strong monsoon winds are blowing. Due to these strong winds, the process in which winds bring nutrients from deep waters happens proficiently and on a large area.[393]

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[390] Heckman, Pinto, and Savelyev.
[391] Heckman, Pinto, and Savelyev.
[392] Heckman, Pinto, and Savelyev.
[393] Eric M. Kramer, *Global Warming The Complete Briefing*, ed. John Houghton, 1st ed. (London: Cambridge University Press, 2019).

Phytoplankton play an important role in providing basic elements of the food, but the increased intensity winds and climate change are making this process harmful, because it is providing nutrients which help in growth of these plankton more than they are required. After the season when an excessive number of these phytoplankton die; the process of decomposition starts. The microorganisms which are responsible for the decomposition of the Phytoplankton drain all the Oxygen. The real danger of these seasonal dead zones is that these dead zones are increasing in size and magnitude. Over the period of time, these can become permanent features of the Ocean, because climate change will increase temperature on the land, and the process of snow melting will increase. [394]

The future projections do not show the signs of improvement in the Indian Ocean. Simulations obtained using the model CMIP5 shows that the heat content of the Indian Ocean will rise, and as result of it, the primary productivity of the Indian Ocean will decrease. This model also showed the changes in PH of the ocean water. Its average PH will decrease from the current value of 8.1-7.8. The range of the PH scale is 0 to 14. The 7 is the neutral value; a solution below 7 is considered acidic. The decrease in the PH of the ocean water means that the Ocean water will become more acidic. One value drop means that water now has 30 percent more acidic nature (increased concentration of hydrogen ion), and the two value drop means the nature of solution has become 150 percent more acidic.[395] Therefore, just a small drop in the average PH value of the ocean will decrease the acidic nature of the water in a significant way. The rise in the Ocean value is expected because of the projection of increased carbon dioxide in 2050. There are some models that are predicting the decline of 1 to 7 percent decline in the Oxygen concentration in the Indian Ocean[396]. An increased temperature, acidification of the Ocean waters, stratification, and decrease in the concentration will decrease the productivity of the Indian Ocean. The impact of these phenomena won't be uniform. There will be some areas where these issues will be more visible and impactful; therefore, it will increase the chances of competition and conflict. Because when fisheries and seafood will decline in one area then fishermen of that area will go where fisheries and seafood is available. It will increase the prospect of the competition. [397]

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[394] Kramer.

[395] Stokke and Oberthür, *Introduction: Institutional Interaction in Global Environmental Change*.

[396] Bigg, *The Ocean and Climatic Change*.

[397] Savage and Qi Feng, "Climate Change Adaptation: The Need for an Indian Ocean Regional Metamorphosis."

This process occurs near the coast of Yemen, Oman and Somalia. Somalia and Yemen are among the poorest countries in the world. Yemen is facing the prospect of famine, while the situation of food security in Somalia is far from ideal. Fisheries and seafood plays an important role in providing food security in these two countries especially to the food security of Coastal communities. Oman has the highest per capita consumption of fisheries and seafood in the Middle East. It is among the countries whose dependence on fisheries and seafood resources is high. Frequent occurrence of these dead zones, and their increase can certainly increase probability of competition for fisheries and seafood resources among communities and nations dependent on fisheries and seafood for food security. [398]

With the Climate change pollution in the Oceans also has a negative impact on fisheries and seafood species. The level of pollution in the Indian Ocean places it on the second number among all the oceans. According to a report there are 1 trillion pieces of plastic present in the Indian Ocean. There is pollution in the Indian Ocean, because it borders many developing countries which don't have proper sanitation systems. [399]Therefore, polluted water from the land is going directly into the Ocean which pollutes the sea. Ocean pollution is also a result of human dependence on the Oceans for transportation. The Indian Ocean is a very important sources of world energy because a large amount of the oil passes through the Ocean. [400]

Historically, many incidents of oil spilling happened in the Indian Ocean. In 1993, due to an accident in an Indian oil processing platform 1600 tonnes of oil spilled into the Ocean. In 2016, another major incident happened in the Eastern Indian Ocean. A Japanese oil tanker spilled 1.4 million gallons of oil into the ocean. Here is the list of other incidents of oil spillage happening in the Indian Ocean Region: In 2013, in Bombay an oil pipeline leaked a big amount of oil into the Ocean. In 2003, a maritime jewel leaked 90,000 barrels of oil into the Indian Ocean. In 2017, another oil leakage incident happened in India. In 2020, 1000 tonnes of oil leaked into the ocean near Mauritius. [401]

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[398] Krishnan et al., *Correction to: Assessment of Climate Change over the Indian Region*.

[399] Ross Michael Pink, *Solutions and Adaption for a Planet in Peril Solutions and Adaption for a Planet in Peril Solutions and Adaption for a Planet in Peril*, 1st ed. (Burbay: Palgrave Macmillan, 2018).

[400] Pink.

[401] Ashley J. Williams, "Chapter III . Oil Pollution and Safety Considerations," *Analysis* 6, no. January (1975): 1971–72.

These are just the few majors' incidents in more than 3 decades; however, the pollution from oil transport is not limited to major oil spills. A major partition of oil pollution, around 80 percent, happens because of small leakage, and there is no record available of these small leakages.

According to the International Owners Pollution Federation, gathering information about these spillages is difficult, and the information about these small oil leakages is usually not complete.[402] Pollution due to oil spills happens, because there are two main routes on oil transportation in the Indian Ocean. The first route is through the Indian Exclusive Economic Zone, which goes around Sri Lanka then Bay of Bengal to the Far East. The second route of the oil is through the strait of Mozambique, Somalia, Kenya and South Africa into Europe. Small Tanker disasters frequently happen along these two ways. The oil leakage and Tanker Disaster aren't only two causes of pollution due to the oil leakage. There are multiple issues which are also polluting waters such as: bilge, bunker, and blast washing. Pollution of the Indian Ocean is also happening due to spillage of oil due to offshore exploration and leakage of the natural gas. Putting things into perspective, the world's 65 percent oil and 35 percent natural gas resources are found in the Indian Ocean. [403]

Even a small amount of spillage can have a catastrophic impact for the environment. Because the density of oil is lower than salt water; therefore, oil starts floating on the surface of the Ocean. Some solvable particles make a layer below the surface and heavy particles reach the sea bed. Thus, oil spills have the capacity to damage the ocean ecosystem at every level. [404]

Around 25 percent of fisheries and seafood species depend on the coral reefs for survival. Hydrocarbons which are present in the petroleum can cause bleaching of these reefs which eventually dies. This is why these spillages are dangerous for the whole environment. Petroleum and oil are categorized in hazardous categories. They pose a great danger to the aquatic system and to those communities which are depending on the Ocean for food security. Pollution in the oceans can have a negative impact on the quality of fisheries and seafood; furthermore, it makes fisheries and seafood unhealthy. According to the definition of food security, available food should be healthy. It means that if food is unhealthy then it can't become part of food security.[405]

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[402] Williams.

[403] Williams.

[404] Timothy R. McClanahan and Caroline Abunge, "Fish Trader's Gender and Niches in a Declining Coral Reef Fishery: Implications for Sustainability," *Ecosystem Health and Sustainability* 3, no. 6 (2017), https://doi.org/10.1080/20964129.2017.1353288.

[405] McClanahan and Abunge.

Another cause of concern in the IOR is the increasing urbanization along coastal cities, pollution, and industrialization exacerbating predicaments for fisheries and seafood. There are issues like: Direct dumping of waste and other things into the oceans; without treatment and half-treated industrial and non-industrial waste; and other economic activities are creating problems for growth of fisheries and seafood. [406]Along the coastline, the quality of water is deteriorating because of overfishing, activities related to navigation, and port activities; furthermore, deterioration is also happening because of recreational activities along the coastal areas. To understand how these activities are affecting fisheries and seafood resources, the knowledge about the fisheries ecosystem is incumbent.

Coastal systems are vital in sustaining fisheries and seafood resources in the Indian Ocean region. Plants near coastline, seaweeds, moderate temperature of water with high mineral and nutrient contents, and the mud present on a coastline is full of small bio organisms which are an important component of the food web of fisheries.[407] The warm and shallow water of a coastline is very important for growth fisheries and seafood resources, because fish lay their eggs in the mud near a coastline and fish larvae emerges from these egg here on a coastline. Apart from larva which emerge from these eggs, larva of some deep sea fish species also come to a coastline for faster growth, because a coastline water is full of nutrients and water temperature remains moderate. These larva return back to the deep oceans after getting big enough. Big fish species from the deep seas also come to a coastline because of immense food resources present on a coastline like, a plethora of small fish. Therefore, a coastlines plays an important role in maintaining food chain of all the oceans.

Due to urbanization, industrial waste, and other numerous human activities along a coastline are a threat to the marine ecological balance. These practices led to decline in fish stock, or in some cases, complete depletion of fish stocks, and disturbance of the whole marine food web. Negative consequences of these practices will be dangerous for coastal communities, and increase the prospect of competition for fisheries and seafood resources. [408]

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[406] Yonglong Lu et al., "Interaction between Pollution and Climate Change Augments Ecological Risk to a Coastal Ecosystem," *Ecosystem Health and Sustainability* 4, no. 7 (2018): 161–68, https://doi.org/10.1080/20964129.2018.1500428.

[407] Lu et al.

[408] Thomas T. Moore, "CLIMATE CHANGE AND ANIMAL MIGRATION," *Enviormental Law* 41, no. 2 (2019): 393–405.

Climate change in the Ocean will increase migration of species. According to sea study in Australia, 45 species moved towards the South due to warming of the Ocean. This can increase the prospect of competition in IOR. There are also concerns about the shift in the distribution of highly valuable fisheries and seafood resources towards high latitude due to climate change. It will impact economics, coastal communities. Tropical fishers will face decline in their catch even if the world takes significant action to stop climate change. If fisheries resources of one country started migrating to another part of the ocean then fishers of that country will go after fisheries resources in that country. [409]It will increase the prospect of conflict among different countries. Tuna is another fisheries and seafood species whose species will increase in the IOR. Tuna species will migrate towards the areas where water temperature is moderate as compared to those areas where the temperature of water is warm and freezing. Therefore, in the IOR Tuna species will move towards the Eastern Indian Ocean, because the temperature of the WIO will increase.

3.6 Fisheries Governance in the Indian Ocean and reasons for competition:

There are many mechanisms for the fisheries and seafood in the region. We can define governance as, "Governance refers to structures and processes that are designed to ensure accountability, transparency, responsiveness, rule of law, stability, equity and inclusiveness, empowerment, and broad-based participation. Governance also represents the norms, values and rules of the game through which public affairs are managed in a manner that is transparent, participatory, inclusive and responsive".[410] Here are the most important element of the governance according to this definition:

(i) Accountability
(ii) Transparency
(iii) Rule of law
(iv) Stability
(v) Equity
(vi) Inclusiveness
(vii) Empowerment

[409] Moore.
[410] David A. Welch, "What Is 'Governance', Anyway?," *Canadian Foreign Policy Journal* 19, no. 3 (2013): 253–67, https://doi.org/10.1080/11926422.2013.845584.

These are the components of the governance in one state, to ensure governance among many States, we have the concept of regional governance. Regional Governance is defined as; "multi-dimensional set of an institution which can answer regional challenges, where regional level represents arrangements between individual nation-states is not dominated by a regional institution and involves a combination policy mechanism located at regional and state level."

Importance element of the governance according to this definition are:

(i) Multi-dimensional institutions

(ii) Ability to answer regional challenges

(iii) Combination of policy mechanism

(iv) Not dominated by a single institution. [411]

In the Indian Ocean region to make actors accountable; their actions transparent; enforcing rule of law; ensuring stability, equity, and inclusiveness; and for enforcement of law regional governance and international governance mechanisms are present. Firstly, the undertaken research will describe these mechanisms and their functions and then analyze reasons of competition despite in placed governing mechanisms.

3.6.1 International Law of Sea

In 1982, the United Nations Convention on Law of Sea (UNCLOS) started its signature process. The implementation of the convention started from 1994 in spirit with article 308 of the same convention. Here are some important provisions which are related to fisheries and seafood resources. [412]

The first provision of the UNCLOS established the boundaries of territory of a state.

(i) According to article 3, a coastal state has complete jurisdiction over all resources in its territorial waters, and it sets the limit of territorial waters to 12 nautical mile from baseline. [413]

It means that a state has complete jurisdiction to exploit all resources available in these waters, and according to the article 17, vessels of other states just have right of innocent passage and article 18 defines the innocent passage and the article 19 defines the meaning of innocent

[411] Welch.

[412] Nations, United Nations Convention on the Law of the Sea.

[413] Nations.

passage. They can't perform any activity inside the territorial waters of another state which is against the law of that territorial state. Laws of a state extend to its territorial waters. According to this article if any country performs fisheries activity in the territorial waters of another country then it will be illegal according to international law. Article 25 of the law gives the right of protection to the state in case passing violates terms and agreement of innocent passage.

(ii) The UNLOS also defines the contiguous zone. According to the article 33, the contagious zone is the area 24 nm from baseline. A state has these rights in this area:

(a) A coastal state can enforce customs, immigration and laws related to pollution in its contiguous zone.

(b) If any actor breaks the above mentioned law in the contiguous zone of a coastal than a state has the right to punish that actor.

It means that a state can take steps to protect illegal activities in its contiguous zone and enforce laws related to pollution. Pollution can harm fisheries and seafood resources. As mentioned earlier, the coastal environment is very important for the growth of marine and fisheries resources; therefore, giving a state jurisdiction to protect its contagious zone can be an important step towards protection of living marine resources.

(iii) The Article 42 of UNCLOS provides regulations related to the states which are bordering straits and related to transit passage. And the section (b) and (c) of article 42 gives guidelines related to fisheries and seafood.

According to the section (b) of the article 42 ships should take steps to prevent pollution from happening by implementing international regulation related to oil discharge, oily discharge and other noxious material into the strait. [414]

These regulations are very important because oil pollution happens due to transportation, which can damage the marine environment. In the Indian Ocean, the strait Hormuz is one of the busiest strait in the world. It is a choke point which is important for transportation of oil in the world.

The section (c) of the article stops any fishing vessels from fishing in the Strait, and it also stops vessels from loading any kind of fisheries and seafood product.

The article 43 section (b) of UNCLOS also gives guidelines related to pollution that happens because of transportation of fisheries and seafood.

[414] Nations.

(iv) It deals with cooperation between users and the bordering state in navigation, safety, aid and taking steps to reduce the pollution happening from ships.

According to section (b) of this article: both states should cooperate to reduce, prevent and control pollution.

The pollution can damage resources of the bordering state; international law asking both state to cooperate to improve safety and navigation. Undertaken research is about the fisheries and seafood and the pollution of the oceans is one the driver of competition for fisheries and seafood resources, because it can have far-reaching impacts for the marine environment and for the communities depend on fisheries and seafood resources. It is imperative to analyze the available mechanisms to control pollution, and the effects of lack of implementation due to various reasons. [415]

The article 46 of the UNCLOS is about the archipelagic states. It defines the archipelagic states and article 51 gives information about the traditional fishing rights of archipelagic states.

(v) According to the article 55 of this law, a coastal state has authority over the Exclusive Economic Zone(EZZ) which extends to 200 Nautical miles, and a coastal state has right over natural resources and certain economic activities and jurisdiction of a coastal state extend to EZZ for the protection

(vi) Article 61 of the UNCLOS is about the conservation of living resources in the EEZ.

1. It gives authority to the coastal state to set the limit of catch.
2. It demands from the coastal state to take measures related to management and conservation according to scientific evidence to eradicate dangers of over-exploitation of fisheries and seafood resources.
3. According to UNCLOS, the coastal state should design management and conservation measures in a way that the harvested species produce maximum output for communities dependent on them, and it can grow back.
4. The coastal state also considers the whole food web associated with the harvested species and when the coastal state sets the limit of exploitation, it should keep in mind the sustainability of the whole ecosystem.

[415] Nations.

5. It also demands from the coastal countries to share relevant information related to catch, stocks information, and other data related to fisheries and seafood with relevant forums.

This article was important, because it gave a character to the EZZ and eliminated the conflicts regarding the legal conflicts; furthermore, this article of the UNCLOS asks the coastal state to take steps related to conservation of marine life in their EZZ. It gives a guideline related to preservation of marine resources and taking steps to stop over exploitation of fisheries and resources. It also demand to set a limit of harvest in a way that it don't impact the coastal communities. It also ask coastal states share data related to catch of fisheries and seafood species. Data sharing is very important because without having the relevant data countries can't formulate policies to policies to prevent overexploitation of fisheries and seafood resources. It also demands steps from the states to ensure biodiversity in the Ocean. However, the states in the Indian Ocean region are very poor and they don't have measures to stop illegal practices in the EEZ. Some states also don't share the data with regional organization. If a state don't share the information then this law don't have any tool to compel state to do so. So, it depends on the good will of the coastal state to share the relevant information or not.

Article 62 of the UNCLOS, gives guidelines about the utilization of living resources.

According the first paragraph of it:

The costal should promote maximum utilization of fisheries and seafood resources in the EZZ without prejudice to article 61. The article 61 is about the conversation of marine resources. This means that the state can harvest fisheries and seafood species keeping in mind the suitability of fisheries resources.

The Second paragraph of the article 62 says:

The coastal state that has authority over EZZ, and it should evaluate its capacity to harvest fisheries and seafood resources of the EZZ, and if the coastal state doesn't have the capacity to harvest it can allow other states to harvest fisheries and seafood resources of the EZZ through agreement, arrangement, conditions, and laws described in the paragraph 4.

The third paragraph of this article says:

The coastal state that has authority over the EZZ while giving access to fisheries and seafood resources to other states should keep in mind its economic interests, national interest, and other factors mentioned in the article 69 and 70. The developing state which is getting access to the EZZ

of other's state should make an effort to reduce the economic dislocation of the community dependent on those EZZ fisheries and seafood resources.

The fourth paragraph of the article say:

The nationals of other states, who got access to the EZZ, should follow rules and regulations of the coastal state that gave them permission to perform fishing activities in the EZZ. These laws and regulation set by the coastal state should be harmonize with the convention in following way:

(a) License of fishermen, equipment, fishing vessels and other forms of compensation which can be financing, and technology related to the fishing industry.
(b) Finding out information about the catch, fixing quota and information of stocks caught during a certain period of time by the national of another state.
(c) Regulating the issues related to fishing activities such as , seasons of catch, species caught, size, the kind of gear which was used, and the size and number of fishing vessels used by the national of state which were performing fishing activities in the EZZ of the coastal state, which gave the permission to carry out fishing activities.
(d) Fixing the size and age of the species caught by the nationals who got the permission to fish the EZZ of the coastal state.
(e) Ensuring fishing vessels depart specific information such as statistics related to fishing catch and the location of vessels.
(f) Conduct of specific fisheries and seafood programs and regulating the process of conducting the research, sampling of the catches and sharing the data obtained from research.
(g) The coastal state should appoint trainees and observe on the vessel which performs research and sampling of the species.
(h) The landing of these vessels should be in the coastal state that has the authority over the fisheries and seafood resources of the EZZ.

The fifth paragraph of the article says:

The coastal state shall give notice of conservation, management laws and regulations efforts.

The Article 63 of the UNCLOS gives guidelines about fisheries and seafood stock that is present between the EZZ of the two or more coastal states and also about the stock that is linked with EZZ of the countries.

The first paragraph of the article 63 says:

1. It gives guidelines related to coordination in measurement of the fisheries and seafood stocks available in the EZZ and in the area attached to the EZZ through regional and sub-regional organizations to ensure the conservation and development of these stocks.
2. Paragraph two of the article gives the same guidelines, but it deals with the area attached with the EZZ of the coastal state.

The article 64 of the UNCLOS deals with the migratory species present in the EZZ. Migratory species are those species which don't stay in one area, but change their location according to the seasons. There is a whole list of migratory species available in the UNCLOS.

The first paragraph of the article 64 says:

1. The coastal state or other states which perform fishing activities for migratory fisheries and seafood species should coordinate with each other through relevant regional, sub-regional, and international organizations to ensure sustainable exploitation.

The article 65 of this UNCLOS covers the marine mammals present in the EZZ. These articles don't restrict the right of the coastal state and international and regional organizations from taking the steps to protect marine mammals. State and international organizations should work together to conserve the population of marine mammals.

The article 66 gives guidelines about the Anadromous Stocks.

1. The first paragraph of the article 66 puts the responsibility on the state where anadromous stocks originate.
2. The second paragraph states that where these stocks originate, that state should take form rule and regulation to manage these stocks in inland water, coastal waters, and in the EZZ. The state where they originate should consult with other states to set the limit for the exploitation of these stocks.

The article 67 of the UNCLOS deals with the Catadromous species.

1. It puts the responsibility of management on the country where these species spend most of their lifetime.
2. The second paragraph gives the guidelines about the harvest location of these species' It says that these species should be harvested towards land at the edge of the EZZ.

3. The third paragraph gives guidelines if these species migrate to water of another state. In this situation, the state where they spend the most time and the state where they migrate, should sign an agreement to manage their stocks.

The article 68 of the UNCLOS is about the sedentary species and the article 69 about the right of landlocked states.

1. The first paragraph of this article 69 gives rights to landlocked states to harvest the extra resources of the EZZ of the coastal states of the same region or sub- region keeping in consideration economic and geographic factors of all these coastal states and it should harmonize with the article 61 and 62.

This article was giving fisheries and seafood rights to those countries which don't have direct boundaries with the ocean. In the Indian Ocean there are countries like Afghanistan and Malawi. There was a debate that Afghanistan should get the right to fish in the Arabian Sea and Malawi get the right to fish in the Bay of Bengal.

2. The second paragraph gives guidelines for setting up the mechanism through the permission to fish could be given to the landlocked states. It says that the terms and modalities should be set using bilateral ways, but keeping in consideration regional and sub-regional agreements.
   (a) The second (a) of the paragraph states that this agreement between the coastal state and the landlocked state should not have a negative impact on the fishing communities and fishing industry of the coastal state.

This article allows a coastal state to share its surplus fisheries and seafood resources with another state through agreement, but it should consider the necessity of the local people before doing this. By asking the state to consider the interest of the fishing communities, this law is addressing the concern of human security.

   (b) The section (b) of the paragraph gives guidelines about to what extent the landlocked state is allowed to exploit fisheries and seafood resources.
   (c) The section of the second paragraph states that the exploitation of fisheries and seafood resources by the landlocked state should be harmonious with the regional agreements and any one state should not face all the burden of the landlocked state.

(d) The section of the paragraph states that the nutritional needs of the population of the coastal state which is allowing the landlocked state to exploit fisheries and seafood resources of the EZZ should be kept in mind.

The proposal to give fisheries and seafood rights to landlocked states has lost its importance. There was no mention of it in the fisheries agreements done after it. This could cause more problems than it would solve.

3. The third paragraph of this article gives guidelines about the issue if a state reaches its full harvesting capacity. It states that in that case the costal should have equitable arrangements with other states to find out the solution.
4. Paragraph 4 of this article gives the guideline about the mechanism of exploitation if the landlocked state is among the developed countries.

The article 73 is about the enforcement of the rules and regulations in the EZZ.

1. The first paragraph gives right to the coastal state to explore, exploit, conserve and manage living resources of the EZZ. The coastal state can take steps such as, boarding, inspection, and arrest to ensure that vessels are following the rule and regulations enforced by the coastal state or regional and international organizations.

This article gives coastal states the right to ensure that vessels which are performing fisheries and seafood activities in the EZZ are complying with rules and regulations. The authority of the coastal state is imperative because without enforcement mechanisms the problems like IUU fishing cannot be resolved. The capacity of the state becomes a problem.

2. The paragraph two of the article 73 states that a vessel and crew must be released after their arrest after getting reasonable security or bond.
3. The third paragraph says that in case of rules and regulations violations, the costal state should not imprison fishing vessels or give any kind of corporal punishment if the costal state doesn't have an agreement with another state.
4. If the coastal state arrests the fishing vessel of another state then the coastal state which makes the arrest should notify the flag state through appropriate channels. The coastal state should inform the flag state about the

The article 74 of the UNCLOS is about the delimitation of the EZZ of between the coastal state and the states attached with it.

1. The first paragraph of this law says that the decision of the border limitation among states should be according to the international law and according to the article 38 of statute of the International Court of the Justice.
2. The state should follow the process given in the part XV if the coastal state does not reach an agreement with another state.

All these rules and regulations are to ensure that states don't go into conflict with each other. This is incumbent, because in the absence of these rules and regulations, the competition for fisheries and resources will become intense.

There are other rules and regulations to prevent states from polluting the oceans. Pollution can seriously damage marine life; therefore, it is imperative to take measures which can damage the ocean.

The article 207 of the UNCLOS is about prevention of the oceans from land based pollution.

1. The first paragraph of this article says that countries shall take steps to prevent the seas from land based pollution. This pollution can be through any ground based resources and the steps to prevent this should be according to international standards.
2. The second paragraph demands from the state that they take measures to control and prevent the pollution that happens due to activities on the land.
3. The paragraph demands states for harmonizing their policies on the regional level.
4. The paragraph 4 of the articles demands from the states to organize conferences and take different measures to make a standard and harmonize their rules and regulation with other countries. While making rules and regulations, countries should take into account the domestic and geographical variables.

The article 208 of the UNCLOS deals with the pollution happening from seabed activities in the national jurisdiction.

1. The first paragraph of this article asks the coastal states which explore the seabed resources of the Oceans to make rules and regulations to prevent pollution.
2. The second paragraph asks states to take different measures to control the pollution happening due to activities in the seabed.
3. The third paragraph asks states to harmonize states rules and regulations with the international rules and regulations.

There are many other provisions of the UNCLOS related to fisheries and seafood management, but describing all provisions is beyond the scope of this research. Undertaken research gives an overview of available governance tools for fisheries and seafood resources in the IOR. There is another important governance tool which was done to fulfil the articles of the UNCLOS. This agreement deals with

3.6.2 Fish Stock agreement:

Article 1 of this agreement provides the required definitions of terms and scopes of this agreement. The section (b) of this article gives the definition of conservation and management measures. "Measures to conserve and manage one or more species of living marine resources that are adopted and applied consistent with the relevant rules of international law as reflected in the Convention and this Agreement".

The Section (c) of this agreement defines fish. It includes the molluscs and crustaceans species; however, it doesn't include those species which are part of the sedentary species. The explanation of it is given in the article 97.

Article 2 of the agreement defines the objective of the agreement which is the long- term conservation and management of the straddling and migratory species through implementation of relevant provisions of the convention.

Article 3 of the agreement deals with the application and article 4 defines the relationship between the convention and agreement. Article 5 of the agreement gives the general principles. It asks states that fish in high seas, to take measures for sustainability of migratory species; furthermore, it asks states to use science to implement measures for sustainability. It also asks states to take care of other matters such as, impact on pollution, by catch and other issues. This agreement also demands from states to share data and take measures to implement the management provisions available in the agreement.

Article 6 is about the application of precautionary measures, and Article 7 gives guidelines about the compatibility of conservation and management measures. Article 8 is about cooperation in conservation and management measures. [416]

Article 9 gives guidelines about formation of regional and sub-regional organizations for the management of the migratory species. It asks states to take biological and socio-economic

[416] Nations.

conditions of the fisheries stock. Article 10 gives guidelines about the functional regional and sub-regional organizations. Article 11 is about transparency in regional and sub-regional fisheries and seafood organizations. Articles 13 and 14 are about the strengthening of the relationship among relational countries and sharing of scientific information.

The article 17 of the agreement is about the duties of those states which are not party to the agreement. The first paragraph of the article says that a state that is not a member cannot violate the principles of this agreement. A vessel flying the flag of the state, which is not part of the agreement, should not allow it to fish for the species that are under conservation measures.

Article 18 elaborates the duties of a flag state; it says that the state whose vessel is carrying fishing in the high sea should make sure that it follows rule and regulations and the state shall only allow a vessel to carry out fishing activities when it complies with rules and regulations.

Article 19 is about the enforcement of rules and regulations. It says that a vessel should follow rules and regulations of regional and sub-regional organizations. A state should take steps to stop these violations no matter where it happens. The state should take steps like physical inspection of a vessel, and it should report the violation to the concerned state, regional and sub-regional organizations.

Article 20 is about international cooperation in the enforcement of rules and regulations. It states that states should cooperate with each other through regional and sub-regional forums. It also asks the state to cooperate in the investigations related to violations of rules and regulations.

Article 21 of the fish stock agreement asks states to cooperate on regional and sub-regional level. It asks states to design procedures and rules for enforcement of rules and regulations. Article 22 deals with the basic procedure of boarding a ship.

Article 23 is about the measures taken by port states. It asks port states to take measures according to international law to enhance effectiveness of the conservation measures taken by the regional and international organization. Article 24 is about the special needs of developing states. It states that while taking conservation measures, regional and sub-regional organizations shall take into account the needs of developing states. It highlights that while taking conservation measures regional and sub-regional organizations should keep in mind the dependency of the coastal state on marine resources.

Article 25 is about the forms of cooperation with developing states. It asks states to cooperate directly or through regional and sub-regional organizations. It also asks states to take measures to

support least developed states, especially small island states that depend on fisheries and seafood resources. It also asks states to help small states in ways that they can participate in high sea fisheries.

Article 26 is about giving special assistance to countries for the implementation of fish stock agreement. It says that special funds should be dispensed to countries who cannot afford to implement rules and regulations.

Article 27 gives guidelines about settlement of disputes through peaceful means. It states that states should resolve their disputes through peaceful means through regional or international agencies.

Article 28 gives guidelines about how to prevent disputes from happening. To achieve this aim, states should use regional and sub-regional organizations for decision making.

Article 29 deals with the disputes of technical natures. It states that in case of a dispute of technical nature, states should form an ad hoc panel of experts.

Article 30 is about the settlement of disputes. It gives a complete way forward to resolve disputes among countries. Article 31 gives provisional measures.

Article 32 is about the limitations on the procedure of disputes settlement. Article 33 deals with non-parties of this agreement. It asks states who are party to this agreement to bring other states in the domain of this agreement as well.

Article 34 is about good faith and abuse of rights, article 35 is about the liability and responsibility; furthermore, article 36 is about the review conference. Article 37 to 40 are about the signature, becoming party of this agreement, entry into force, and accession. [417]

3.6.3 Indian Ocean Tuna Commission (IOTC):

This commission deals with the issues related to Tuna management in the IOR. Tuna is one the most important species in the IOR. It is highly valuable; its demand in the international market is increasing as well. IOTC consists of 24 countries. This commission works under the framework of FAO. The significant thing about this commission is that it has binding power under the article XI of its rule to enforce conservation and management measures, but it didn't adopt binding measures till now. It consists of 30 countries and the majority of its states are from IOR. The

[417] United Nations, Fish Stocks, *United Nations Website* (The US, issued 1995), https://doi.org/10.1016/B978-0-12-384719-5.00223-9.

countries from the IOR are part of the Tuna commission: Pakistan, India, Indonesia, Tanzania, Iran, Yemen, Malaysia, Madagascar, Kenya, Comoros, Bangladesh, and Australia. [418]

According to the IOCT commission it has four main functions.

1. It keeps check on the condition of Tuna Stock and gathers data related to it; furthermore, it also shares critical scientific information and other relevant statistics which helps in the conservation and management of Tuna Stock.
2. The second function of Tuna commission is that it facilitates research activities related to Tuna Stocks in the IOR and other research related to other species which comes in the domain of Tuna Commission. It also performs other activities such as capacity building of the other nations through transfer of technology, training, and other activities that ensure equal participation of all members in bid to achieve its objectives.
3. It adopts basic scientific evidence to ensure conservation of Tuna and other fish stock which comes under the domain of this agreement for the best use of available resources.
4. It also contextualizes conservation efforts, keeping in view the countries where its domains lie consist of developing countries; therefore, it is important to know their social and political situation. [419]

3.6.4 South Indian Ocean Fisheries Agreement

South Indian Fisheries Agreement is another body formed in the IOR to regulate fisheries and seafood resources. This body was not formed under the XIV of the FAO constitution, but in reality it is working outside of the framework of the FAO. This organization is only focused on the high seas and not covering the territorial waters. Unlike the Tuna commission, it focuses on a wide range of species including migratory species like Tuna as well. This organization focuses on the precautionary approach to protect biodiversity. [420]

3.6.5 South West Indian Ocean Fisheries Commission

This fisheries commission was under article VI of the FAO constitution. This commission is connected with SIOFA. The purpose of their formation was that they will meet back to back. The

[418] Indian Ocean Tuna Commission, "IOTC | Indian Ocean Tuna Commission / Commission Des Thons de l'Océan Indien," Indian Ocean Tuna Commission, 2021, https://www.iotc.org/.
[419] Commission.
[420] Southern Indian Ocean Fisheries Agreement, "Southern Indian Ocean Fisheries Agreement (SIOFA) | SIOFA," Southern Indian Ocean Fisheries Agreement website, 2021, https://www.apsoi.org/.

purpose of SWIOFC is to give states a forum for the cooperation, because this commission can only give recommendations. Moreover, it doesn't have any managerial powers.

3.6.5 Western Indian Ocean Tuna Organization:

This commission was formed for the countries of the Western Indian Ocean. Despite its formation in 1992, it couldn't work because of financial constraints. It had functional similarities with forum fisheries agency; furthermore, it didn't have any regulatory powers according to its agreement. The main aim of this commission was to establish a coordination mechanism between island states of the IOR. [421]

3.6.6 The Regional Commissioner for fisheries

This fisheries body is focused on the Gulf region; it was formed under article XIV of the FAO. Its enforcement happened in 2001, and article XIV of the FAO applies to the Gulf Region. It deals with the following things:

(i) Conservation of fisheries and seafood resources
(j) Ensuring rational management of these resources
(k) Facilitating development of sustainable aquaculture
(l) Ensuring proper utilization of living marine resources

The main role of this commission is that it can give recommendations to state on the above mentioned points. To make its recommendations binding, two third majority is required, and if no state objects on its recommendation after some period of time. This organization doesn't address issues related to bio-diversity. [422]

3.6.8 Commission for Conservation of BlueFin Tuna

The purpose of this commission is to manage the resources of Bluefin Tuna, which is a migratory species. This commission deals with its migration in a vast area. It covers their migration in the

[421] Dennis Rumley, Sanjay Chaturvedi, and Vijay Sakhuja, *Fisheries Exploitation in the Indian Ocean Region*, ed. Dennis Rumley, Sanjay. Chaturvedi, and Vijay. Sakhuja, *Fisheries Exploitation in the Indian Ocean: Threats and Opportunities*, 1st ed. (Singapore: Institue of South Asian Studies, 2009), https://doi.org/10.1355/9789814279406-004.
[422] United Nations Food and Agricuture Organization, "Regional Commission for Fisheries (RECOFI) | FAO Regional Office for Near East and North Africa | Food and Agriculture Organization of the United Nations," United Nations Food and Agriculture Organization, 2021, http://www.fao.org/neareast/recofi/en/.

Indian Ocean, Southern Ocean, and in the breed of Java. It consisted of a few countries when it was formed, but now it has 8 members including the EU. [423]

3.6.9 The Indian Ocean Marine Affairs Cooperation:

This body of the Indian Ocean mainly deals with issues of biodiversity. This is a Sri Lanka based body and was formed in 1985.

3.6.10 Different scope of article VI and XIV Bodies:

Before discussing the problem of governance in the Indian Ocean region, which leads to competition for fisheries and seafood resources, drawing the distinction between the organization established under article VI and XIV is vital.

The bodies established under article VI don't have any binding power, and their role is limited to the advisory bodies. They just give advice on matters related to conservation and management. Their rule is defined in article 1 of the FAO constitution.

In contrast to bodies established under the VI, bodies established under article XIV have the binding powers. These organizations become part of the already present United Nations framework. These organizations have characteristics of treaty regimes that's why in some cases they can become a binding organization. A few examples of such institutions are: IOTC, GFCM, and RECOFI.[424]

Some bodies which were formed under the article XIV of the FAO constitution have considerable powers. In the IOR, the bodies which were formed under this article are the IOTC and RECOFI. Despite having strong powers, the IOTC has lost its effectiveness due to multiple reasons. One of these reasons is the interest of countries in exploiting Tuna resources.[425]

3.6.11 Port State Agreement:

One of the reasons for competition in the IOR is illegal and unregulated fisheries and seafood practices. To curb these practices, the FAO signed a binding agreement to stop these things from happening. Here is a brief description of the port state agreement, which has 80 members now.

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[423] Commission for the Conservation of Southern Bluefin Tuna, "Commission for the Conservation of Southern Bluefin Tuna - Department of Agriculture," Australian Government Website, 2021, https://www.agriculture.gov.au/fisheries/international/ccsbt.

[424] Rumley, Chaturvedi, and Sakhuja, *Fisheries Exploitation in the Indian Ocean Region*.

[425] Rumley, Chaturvedi, and Sakhuja.

Article 1 of the agreement defines the terms used in the agreement. Article 2 of the agreement describes the objectives of it, which are to stop illegal and unregulated fishing practices. Article 3 and 4 describe application and relationship of port of state agreement with international law and other law instruments respectively.

Article 5 of the port state agreement talks about the integration of fisheries management measures at national level. It asks states to synchronize measures suggested in the port state agreement with the other measures of state control established at the ports.

Article 6 of the port state agreement asks states to cooperate with each other for better enforcement. State should cooperate in sharing information and data. This exchange of information should happen among the concerned states, the FAO, regional and sub-regional fisheries and seafood management organizations.

Article 7 deals with the operational part of the FAO agreement. It asks states to designate a specific port to the vessels performing fisheries and seafood activities.

Article 8 and 9 deals with the advance permission to enter into the port and refusal of permission by a state for a vessel that wants to enter into the port.

Article 11 deals with the use of port by a vessel, and article 12 is about the inspection and level of fisheries management in the IOR; article 13 describes the procedure of conduct of inspection; furthermore, article 14 gives guidelines about the result obtained after the inspection.

Article 15 gives guidelines about communication. It asks a state, who carries out inspection, to convey inspection results to the state whose flag the vessel was carrying.

Article 16 of this agreement is about the exchange of information. It asks a state to transfer information through electronic means.

Article 17 gives guidelines about taking capacity building measures. It asks the state to train inspectors for the inspection of vessels.

Article 18 is about the actions which will precede after the inspection of a vessel. If a vessel was found in violation of the concerned measures then what steps a country can take was told in this article. Article 19 is about the information recourse of the port state.

Article 20 describes the responsibilities of a flag state. Article 21 is about the requirements of developing states.

Article 22 is about the dispute settlement among the states. It asks for peaceful resolution of disputes among states.

Article 23 is about the countries that are not party to this agreement. It asks states to take steps to encourage states that are not parties to this agreement to join this agreement.
Article is about monitoring and review and 25 is about signatures. [426]

3.6.12 Problem of Governance and competition for fisheries resources:

Fisheries governance is important to regulate competition for the fisheries and seafood resources in the IOR. Specifically, there are numerous challenges faced by the institutions responsible for providing fisheries and seafood governance in the IOR. One of the institutions that is responsible for providing fisheries governance is the Indian Ocean Tuna commission. However, due to the multiple problems the commission is unable to deliver effective governance. Some these problems are as follow:

(i) First of all, its treaty is not effective, because it is not according to the basic principles of the United Nations Fish Stock Agreement, and has become an old treaty. In addition, it is just covering the Tuna species, and ignoring other migratory species. Since the food web of Tuna depends on the other species, it can't protect the population of Tuna as well; therefore, it is unable to play its main role of sustaining Tuna population at a sustainable level.[427]

(ii) The second Problem of governance IOTC is facing is due to the lack of independence. As it is not an independent body, it comes under FAO, and its decisions are made according to the complex rules of FAO; furthermore, its day to day matters and most importantly financial matters are in the hands of FAO. In addition, all important fisheries players can't get membership.

(iii) As all states don't have equal resources, the implementation of key decisions have become a challenging task. Besides, it also lacks the data of the artisanal and industrial fishing vessels of developed states. Consequently, without effective data, the commission can't take effective decisions that can help in protecting the tuna resources.

(iv) With the lack of data, it also lacks the capacity of conducting independent scientific research. Scientific research is key in understanding for making informed decisions about the fisheries and seafood species. Climate change is rapidly changing the

[426] United Nations, "Port State Agreement" (New York, 20211).
[427] Claire van der Geest, "Redesigning Indian Ocean Fisheries Governance for 21st Century Sustainability," *Global Policy* 8, no. 2 (2017): 227–36, https://doi.org/10.1111/1758-5899.12447.

composition of the Oceans; hence, scientific research is rudimentary for effective Oceanic governance. [428]

(v) The fifth limitation that makes this commission ineffective is the lack of the mechanism for the implementation of its rules and regulation. Moreover, it doesn't have the system to verify if a vessel is complying with rules and regulations or not.

(vi) Many countries of IOTC don't take it seriously, and France, which is a powerful country, undermines the working of IOTC, because it impacts its Tuna catch.[429]

All these points impact the effectiveness of Tuna commission to a large extent. The effective implementation is the key for reducing competition for fisheries and seafood resources. In addition, the Tuna is the most valuable species produced in the IOR, and its demand is increasing in the International market. Furthermore, as it was said in the theoretical approach, countries tend to cooperate when an issue won't be damaging their interest; however, when an issue damages their interest, they won't cooperate and go for competition. [430]

Therefore, without improving its mechanism, it won't be able to stop competition in the IOR.

The Southern Ocean Fisheries agreement is another institution that is responsible for ensuring fisheries and seafood governance is the southern part of the Indian Ocean. However, due to many challenges, it is unable to provide effective governance in the Indian Ocean. Here are a few problems that the SIOFA is facing in the realm of governance:

(i) Many countries kept doing unregulated fishing due to the lack of treaty enforcement. The treaty enforcement remained delayed for a long time.

(ii) The second problem SIOFA is facing is the problem of limits. Its jurisdiction is limited to the national jurisdiction, and all the territories beyond the national jurisdiction do not come under its jurisdiction. In addition, a considerable part of the northern ocean does not come under its jurisdiction; therefore, unregulated fishing remains prevalent.[431]

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[428] van der Geest.

[429] Aparna Roy, *Blue Economy in the Indian Ocean: Governance Perspectives for Sustainable Development in the Region, ORF Occasional Paper*, 2019, https://www.orfonline.org/wp-content/uploads/2019/01/ORF_Occasional_Paper_181_Blue_Economy.pdf.

[430] Roy.

[431] Marcus Haward, "National Ocean Governance and Sustainable Oceans," *Australian Journal of Maritime & Ocean Affairs* 8, no. 4 (2016): 267–68, https://doi.org/10.1080/18366503.2016.1254897.

There is another institution that is responsible for fisheries and seafood governance in the Indian Ocean is the South Western Indian Ocean Commission. It also has many limitations that affect its progress. Some of these limitations are:

(i) It is unable to build governance structures at the national level.

(ii) This commission just has an advisory role as compared to the other commissions that have binding decision making power. Furthermore, it has the conflict of jurisdiction and species with other commissions that is why it is unable to perform its role. In addition, it has a conflict with other commissions in obtaining data as well as in giving scientific advice.

(iii) It has limitations on membership as well. Its membership is only limited to the coastal state of the area. States of other areas are not allowed to become members of this commission. [432]

The Indian Ocean Rim Association is another organization that plays a role in fisheries and seafood governance in the IOR. Here are some of the limitations it faces in ensuring fisheries and seafood governance in IOR.

(i) The first problem this organization is facing is that it has a very limited membership. Even all countries of the Indian Ocean Rim are not members of this organization. In addition, this organization lacks the political will and financial resources to ensure fisheries and seafood governance.

(ii) It has the lack of coordination with other fisheries and seafood organizations of the IOR. Furthermore, it has a limited capacity to conduct important research activities related to fisheries and seafood. [433]

The overall fisheries and seafood governance in the IOR has five key areas where it lacks.

(i) The Indian Ocean region consists of 37 states. All these states border the Indian Ocean, and obtain fisheries and seafood resources from IOR. However, there is not a single organization where all these countries are members. It is important that IOR countries come together to improve coordination; enhancing cooperation for

[432] Haward.

[433] Marcus Haward, "Editorial: Emerging Issues in International Oceans Governance," *Australian Journal of Maritime & Ocean Affairs* 8, no. 1 (2016): 1–2, https://doi.org/10.1080/18366503.2016.1174358.

mitigating challenges like climate change; identifying issues, and for finding regional solutions that are not difficult to implement. If all countries could come on a single platform, then it would be a fruitful step for all countries; nevertheless, no effort is visible in this regard.

(ii) The management mechanism for the species that do not migrate a lot, and for shared and straddling species is not enough. The SIOFA can't manage these fisheries and seafood species in the high seas of countries such as Pakistan, Iran, India, Bangladesh, Myanmar, Thailand, Indonesia, and some parts of Australia. India and Indonesia are the two biggest producers of fisheries and seafood in IOR; in addition, they also rank among the top ten producers in the world. Besides, Bangladesh, Myanmar, and Thailand also highly depend on fisheries and seafood species for food security and are among top producers in the IOR. Due to the connectivity of the Ocean and its food web, any measure without these countries is insufficient to maintain the fisheries and seafood resources at a sustainable level. As a result of lack of mandate in these countries, this commission can't perform activities such as collection of data, and coordination with these countries to ensure sustainable production of fisheries and seafood resources. [434]

(iii) The protection of highly migratory species and the species that are similar to Tuna is insufficient. Some migratory species such as sharks do not come under the mandate of any regional organization, thereby no framework is available for the protection of these species.

(iv) Climate change is the biggest threat that the IOR is facing. It is going to change the chemistry of the oceans and threaten the food security of the population. To overcome such a huge challenge, there is no mechanism avaible to monitor the health of all marine life. The research and monitoring of the regional fisheries and seafood organization is limited to targeted species. This species based mechanism is insufficient to meet the new challenges to marine life. Therefore, the current state and method is insufficient to stop competition for fisheries and seafood resources. [435]

[434] Haward.

[435] Williams, "Chapter III . Oil Pollution and Safety Considerations."

(v) Fisheries management is another area that demands attention in the IOR. The fisheries and seafood management is the key to reduce the possibility of competition for fisheries and seafood resources. A better fisheries and seafood management system can stop wastage of fisheries and seafood resources. Currently, there is no ocean wide management system available. Without this system, the identification of the IIU fishing practices, and independent verification of flag state control is not possible. IIU fishing practices are posing great challenges to fisheries and seafood resources in the IOR. They are damaging the ecosystem of the ocean as well as damaging the fisheries and seafood resources. These practices increase the possibility of fisheries and seafood resources in the IOR. The absence of this system also negatively impacts the stock assessment and the current status of fisheries and seafood resources. Furthermore, without it, the right management measures become impossible. Consequently, it will result in increasing the possibility of competition for fisheries and seafood resources in the IOR. [436]

(vi) The fisheries and seafood management required a huge amount of resources. Despite the realization of the importance of fisheries and seafood resources, many countries of IOR lack the resources to manage even their artisanal fisheries and seafood resources, so, managing fisheries resources in EZZ becomes an impossible task. Although many regional fisheries organizations work to improve the capacity of fisheries and seafood resources, these organizations lack the resources to meet the challenge on the scale it is required. [437]

There is another problem that is impacting the fisheries governance is the subsidies given by different countries. Although the World Trade Organization made an effort to negotiate mechanisms for fisheries and seafood subsidies, these negotiations failed due to the disagreement on the treatment China and other economies are getting. China has the biggest industrial fleet and the consumption of fisheries and seafood is increasing in China; furthermore, other developing economies are the including in countries where the middle class is growing. Therefore, the subsidy given to the fishing vessels of these countries creates an immense impact on the fisheries

[436] Ray Hilborn et al., "When Can Marine Reserves Improve Fisheries Management ? Jos E" 47 (2004): 197–205, https://doi.org/10.1016/j.ocecoaman.2004.04.001.
[437] Hilborn et al.

production and damages fisheries resources, because these fishing vessels can perform fisheries and seafood activities for a long time.

There is also a discord among the countries of the Western Indian Ocean when it comes to the resources of Tuna. Although regional institutions helped countries in managing fisheries and seafood resources, it was not able to formulate a strong cooperation between countries due to their socio- economic interests. Countries of the Western Indian Ocean have disagreement on three issues: allocation of fisheries and seafood resources; monitoring of fisheries and seafood resources, and in bilateral agreements. [438]

The competition among these countries proves the point of the theoretical approach that says: Countries will cooperate on the issues that are not harming their national interest; nevertheless, countries will compete on the issues that are harming their national interests. This is visible among the behavior of the western Indian Ocean region countries. [439]

There are many countries in the WIOR that depend on foreign aid from countries such as China, Japan, and the EU. This aid helps these countries in maintaining good economic conditions at home. To get this aid, these countries make fisheries and seafood food access agreements with these countries. The EU and Japan invested heavily in Madagascar, Mauritius, and Seychelles. Therefore, these countries don't agree on an allocation proposal and demand a huge share, and this behavior of countries creates challenges for regional governance structure. [440]

3.7 Concluding the debate: Competition or Cooperation?

This section combines findings from chapter 2 and Chapter 3 to find out possibility for competition for fisheries and seafood resources. The Non-traditional security approach considers states as well as non-state actors as an object of security; in addition, the threat that decline of fisheries and seafood pose a threat to national security of states. The Non-traditional security approach talks about the interplay of different security dynamics such as link between the human security and the state security and talks about the connection of different security threats. [441]This section combines

[438] M Andriamahefazafy, C A Kull, and L Campling, "Connected by Sea , Disconnected by Tuna ? Challenges to Regionalism in the Southwest Indian Ocean," *Journal of the Indian Ocean Region* 0, no. 0 (2019): 1–20, https://doi.org/10.1080/19480881.2018.1561240.

[439] Andriamahefazafy, Kull, and Campling.

[440] Andriamahefazafy, Kull, and Campling.

[441] Mely Caballero-Anthony and Alistair D.B. Cook, "NTS Framework," in *Non-Traditional Security in Asia: Issues, Challenges and Framework for Action*, ed. Mely Caballero-Anthony, 1st ed. (Singapore: Institue of South Asian Studies, 2013), 340, https://books.google.com.pk/books?hl=en&lr=&id=xJMGtMvvjgcC&oi=fnd&pg=PR5&dq=Non+traditional+securi

findings from chapter 2 and Chapter 3 to find out possibility for competition for fisheries and seafood resources. The Non-traditional security approach considers states as well as non-state actors as an object of security; in addition, the threat that decline of fisheries and seafood pose to a state security. The Non-traditional security approach talks about the interplay of different security dynamics such as link between the human security and the state security and talks about the connection of different security threats. Competition for fisheries resources will happen, because food is becoming a national security issue. Food security should be consider a nontraditional national security, threat because it can have impact on security and stability of countries and can impact well-being of its population. Food security be consider a threat to national security at the three levels. Those three levels are:

(i) First, there can direct threat to food supply where physical access to food becomes a challenge.

(ii) At the second level, when public access to food was challenged.

(iii) Third can emerge from food insecurity from long period of time that can change into migration on national and regional level. [442]

A vivid example of food in national security was resolution passed by the United National Security Council that condemned starvation as form of warfare.[443] Many countries of IOR region depends on fisheries and seafood. It is an important source of direct and indirect food security. Food security is the issue that deals with human security and has the ability to become the issue of state security. The Undertaken research is about the importance of fisheries and seafood in food security; furthermore, it talks about the importance of fisheries and seafood resources obtained from the Indian Ocean. Fisheries resources obtained from the Indian Ocean are extremely important. In the previous chapters, countries of the IOR were divided into four groups. In the first group, those countries were included that were highly dependent on fisheries and seafood resources. In the first group, countries that are highly dependent, in the second group medium high dependent countries, in the third medium dependent, and in the fourth group, low dependent countries were placed.

ty+framework&ots=gHmPSP5Yh5&sig=NMHjRj7A1_v5cnlZCtwTpuEGdUM#v=onepage&q=Non traditional security framework&f=false.

[442] Aron M. Troen Ehud Eiran, Michaela Elias, "Food Should Be Treated as a National Security Issue," foreign policy, 2020, https://foreignpolicy.com/2021/01/23/food-hunger-national-security-issue-instability/.

[443] Ehud Eiran, Michaela Elias.

In the first group, Sri Lanka, Bangladesh, Maldives, Malaysia, Thailand, Indonesia, Egypt, Seychelles are included.

In this group, Sri Lanka, Bangladesh, and Egypt are not self-sufficient in the fisheries and seafood production as shown in the 2.2 Table of Chapter 2; nevertheless, these countries are heavily dependent on fisheries and seafood resources for food security. In addition, among these three countries, Sri Lanka is more vulnerable and dependent on marine catch. The share of marine capture in the total production is 80 percent as shown in the chapter 2, while the share of marine capture in Egypt and Bangladesh is 22 and 16 percent respectively. In this group, Indonesia is the biggest fish producer and it obtains 55 percent fisheries and seafood resources from the Ocean; however, it doesn't get all fisheries and seafood resources from the Indian Ocean, because it borders with the Pacific Ocean as well. Furthermore, the share of aquaculture in its production is increasing, which can further decrease the possibility of conflict for marine fisheries. Myanmar and Thailand get 48 and 54 percent of their fisheries and seafood from marine capture respectively, and Malaysia, Mauritius, Seychelles, and Maldives get 84 percent, 100 percent, 94 percent, and 100 percent from marine capture as shown in figure 2.2 in the second chapter. It means that these countries are highly vulnerable to fisheries obtained from the Indian Ocean; the importance of the fisheries and seafood obtained from the Indian is immensely high. However, the percentage of poverty remains low in these countries as shown in chapter 2. Dependence of coastal communities Due to interaction of many variables, the competition for fisheries resources is still a possibility. Undertaken research discusses these factors and some examples in the next paragraphs.

Climate change, controlling the Ocean pollution, and overcoming challenges of unsustainable fisheries practices can impact the fisheries and seafood resources in the IOR. The impact of climate change on the overall food security situation will help in determining fisheries and seafood resources. For example, one study pointed out that climate change will impact people's access to food due to the high prices, and the availability of food due to the low production. Furthermore, it can harm people's welfare and consumption. Therefore, the decline of fisheries and seafood obtained from the Indian Ocean might not be a threat for the Malaysian state security despite high consumption, low poverty and prevalence of undernourishment; however, combined with negative

impacts of climate change, the decline of fisheries and seafood can become a serious nontraditional national security threat challenge for the Malaysian State.[444]

Another example of Bangladesh is that it has reduced its dependence on fisheries and seafood obtained from the marine capture. The impact of climate change can increase the importance of fisheries and seafood obtained from the Indian Ocean. Bangladesh is facing a huge risk due to climate change; climate change poses even a great risk to food security in Bangladesh. Climate change can impact the production of agriculture due to the factors such as, unpredictable rain, cyclones, low yield from lands, threat of disease, and many other factors can increase the importance of fisheries and seafood obtained from the ocean. Furthermore, it is not self-sufficient in the production of fisheries and seafood; in addition, it is among LIFDC countries. However, in the recent years Bangladesh has seen a rapid economic growth and people's economic condition is improving, nevertheless, climate change can increase poverty, and according to one report, climate change can hinder the poverty elimination efforts. Fisheries communities of Bay Bengal are already near depletion. Millions of people rely on these resources Therefore, their migration to other area can cause social instability. The cases of migration due to depleting resources have started. [445]

Maldives, Mauritius, and Seychelles are the Island nations. They heavily rely on fisheries and seafood. Their dependence on fisheries and seafood remains high, and for them, fisheries and seafood remain important. Their reliance on fish is high, and it can a great threat from them because large portion of their food is coming from the ocean as shown in chapter 2. The decline in fisheries production alone don't create a serious challenge. As seen in the group of low dependent countries, those countries are not self-sufficient in the production of fisheries and seafood; however, their per capita supply is higher than countries that are self-sufficient in the production. In case of Maldives, Mauritius, and Seychelles, their economies also depend on fisheries and seafood resources. Therefore, in case of these countries, the threat becomes even bigger. Furthermore, in combination

[444] Haliza Abdul Rahman, "Climate Change Scenarios in Malaysia: Engaging the Public," *International Journal of Malay-Nusantara Studies* 1, no. 2 (2018): 55–77, https://www.researchgate.net/publication/329642223_CLIMATE_CHANGE_SCENARIOS_IN_MALAYSIA_ENGAGING_THE_PUBLIC.

[445] Amitav Ghosh and Aaron Savio Lobo, "Bay of Bengal: Depleted Fish Stocks and Huge Dead Zone Signal Tipping Point | Fishing | The Guardian," Guardian, 2017, https://www.theguardian.com/environment/2017/jan/31/bay-bengal-depleted-fish-stocks-pollution-climate-change-migration.

with other variables, the importance of fisheries resources can increase further. Hence, competition for fisheries resources is still a possibility.

The second group consists of medium-high countries. In this group, countries such as Tanzania, Madagascar, Comoros, Mozambique, and Somalia are included. The majority of these countries are not self-sufficient in the production of fisheries and seafood except Mozambique as shown in Chapter 2. It means that these countries depend on import of fisheries and seafood. The share of marine capture remains high in these countries; the share of marine capture is 98 percent in Tanzania, and 100 percent in Madagascar. Furthermore, the share of marine capture in Sudan is 86 percent, and in Mozambique, it is 68 percent. Consequently, these countries have a high dependence on fisheries and seafood resources obtained from the Indian Ocean. Besides, these countries are among the poorest countries in the world as shown in chapter 2. Therefore, they rely more in the production of fisheries and seafood more than any other country. Consequently, importance of fisheries remain there for these countries. So, competition is still a possibility.

The per capita supply of fisheries and seafood in the second chapter except in Mozambique and Comoros. These countries are among the poorest nations; their affordability score is very low as shown in 2.12 figure. In addition, the percentage of population that lives under the poverty line is very high, and they are LIFDC countries. As far as the consumption of fisheries is concerned, it remained low except in Comoros and Mozambique. Therefore, it is evident that people don't have an economic access to fisheries and seafood. It makes their fisheries and seafood resources more important, because they can't import fisheries and seafood. Although the amount of protein these countries get from fisheries and seafood is not very high, the level of undernourishment and the global hunger index ranking, as shown in 2.14 figure, make this much protein important as well. Specifically, the coastal communities are at risk.

The Madagascar is among the poorest nations and majority of its population is facing the chronic malnutrition. It is among the group of countries that will face massive problems due to climate change. Besides, it's 40 million population lives in the zone that faces a huge impact due to climate change. In 2015, its rice on thousands of hectares had destroyed. This led to the increase of food prices in Madagascar.[446] Similarly, studies have predicted that Tanzania will face food insecurity and increase in poverty due to climate change. There is a deep connection between poverty and

[446] World Food Programm, "Madagascar's Hungry 'Holding on for Dear Life', WFP Chief Warns | | UN News," UN News, 2021, https://news.un.org/en/story/2021/06/1094632.

malnutrition.[447] Currently, 25 percent of its population is undernourished shown in chapter 2. In the same way, by introducing the new variables, countries dependence on fisheries and seafood resources become very high. It shows that fisheries and seafood are an important element of food security and can play even more important role. Therefore, depleting fisheries resources are state pose a national security threat, thereby increasing the competition for fisheries and seafood is possible, because climate change and other factors has enhance the demand for these resources. In addition, the coastal communities exclusively depend on these resources.

After Medium high countries, the group of medium countries come. In this group, countries such as Pakistan, India, Iran, Israel, South Africa, Kenya, Oman, Djibouti and Australia are included. In this group, the share of marine capture in the production of Oman, Djibouti, and South Africa is highest. Oman and Djibouti get their 100 percent share from the Indian Ocean; Oman and South Africa do not rely on exports; however, Djibouti depends on import of fisheries and seafood for fulfilling its demand. Although Pakistan and India are sufficient in fisheries production, their per capita supply is very low.

In this group, Oman, Israel, and Australia have the highest per capita supply despite not being self-sufficient in the production of fisheries and seafood. It shows that if a country has a strong economy, then in-sufficient production will not be an issue, because it can import these products. In contrast to these three countries, Djibouti and Kenya are also not self-sufficient in the production of fisheries and seafood, and their per capita supply of fisheries and seafood is just around 3 kg shown in chapter 2. However, in the case of these two countries, the low per capita supply can be because of low demand, because of the low per capita consumption of fisheries and seafood.

Oman gets the most protein from fisheries and seafood, and the percentage of its population facing malnutrition is 7 percent. Oman's economic condition and affordability score is good as shown in chapter 2; however, climate change can impact productivity in Oman, and the threat of drought and floods is increasing. Keeping in mind the threat of Climate change to the overall food security, the dependence of Oman on fisheries and seafood resources can increase. Furthermore, climate change will impact the fish productivity in all the Oceans, thereby increasing the risk of inflation and people's physical and economic access. Hence, Oman's dependence on fisheries will increase,

[447] Shimelis Behailu Dessu and Assefa Mekonnen Melesse, "Impact and Uncertainties of Climate Change on the Hydrology of the Mara River Basin, Kenya/Tanzania," *Hydrological Processes* 27, no. 20 (2013): 2973–86, https://doi.org/10.1002/hyp.9434.

and can intensify the competition for fisheries and seafood resources. The non-traditional security approach also acknowledges the importance of the government.[448] Oman has an authoritarian government, and authoritarian governments need stability, and if it is unable to ensure people's physical and economic access, then it will challenge the legitimacy of the government. Therefore, an authoritarian government can be more sensitive in ensuring food security. [449] Therefore, fisheries resources are an important non-traditional security threat for Oman.

The other countries of this group also don't get a lot of protein from fisheries and seafood. However, these countries can also face competition due to the declining fisheries resources. For example, India is the second largest country in terms of population in the world. India is not dependent on fisheries resources for food security; however, due to the threat of climate change, these resources become more important. There are some studies that predicted the 17 percent decline in the food production due to climate change in India.[450] However, India is adopting ways of development that are less carbon producing.[451] Climate change is already impacting the coastal population in India; people are migrating to other areas due to it. Migration can cause political instability, and political instability can create challenges for a state. In the same way, fisheries and seafood can cause challenges to state security when combined with other issues. There already signs of migration in Bay of Bengal area. [452]

The fourth group consists of those countries that are least dependent on fisheries and seafood. It consists of mostly Middle Eastern Countries. Chapter 2 of undertaken research shows that these countries are not self-sufficient in the production of fisheries and seafood; however, they rely on export of fisheries and seafood. Furthermore, the majority of countries in this group such as Saudi Arabia, Qatar, UAE, Singapore, Kuwait, Jordan, and Bahrain have high per capita income, and their affordability score is good. It means that they can rely on exports of fisheries and seafood. Fisheries resources are not an existential threat for them as well.

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[448] Guy Jobbins and Giles Henley, *Food an Uncertain Future The Impacts of Climate Change on Food Security and Nutritition in the Middle East and North Africa*, 1st ed. (London: World Food Programm, 2015).
[449] Jobbins and Henley.
[450] MALANCHA CHAKRABARTY, "While Large Sections of the Indian Population Suffer from Acute Undernutrition," *ORF Isse BRIEF*, no. 157 (2016).
[451] Jobbins and Henley, *Food an Uncertain Future The Impacts of Climate Change on Food Security and Nutritition in the Middle East and North Africa*.
[452] Nair K Shadananan, "Climate Change Impact on the Coastal Zones of India : Challenges in Adaptation," *Nansen Environmental Research Centre*, n.d., 682016.

As shown in Chapter 2 of undertaken research, Iraq and Syria don't have a strong economy as compared to the other countries; however, the consumption of fisheries and seafood is low in their country. The per capita supply of fisheries and sea is high in all countries except two countries that are Iraq and Syria. It shows that economic strength holds the key for physical access to fisheries and seafood.

As shown in Chapter 2 of undertaken research, the percentage of protein obtained from fisheries in low dependent countries is gradually increasing, and in the UAE where people get 16 percent of their animal protein from fisheries and seafood. Fisheries and seafood per capita consumption increasing in Saudi Arabia as well.

These countries' reliance on fisheries and seafood is at the minimum level; furthermore, their economies heavily rely on fossil fuels. However, the world is moving towards green energy. Furthermore, countries have set a target of zero carbon emission till 2050.[453] This can impact the economic structure in these countries and can impact their economic power. Furthermore, the impact on the economic power of these countries' people can impact their physical access to food. In recent years, the UAE increased storage of food and took measures to ensure availability of food during the pandemic. Nevertheless, these countries are taking steps to reshape their economies and supply chains. However, these countries can face challenges, because they all rely on exports. During pandemic food prices in went high. Due to threat of climate change these countries can face more serious problems.

The Non-traditional security framework allows us to discuss human security with state security. These communities are extremely dependent on fisheries and seafood. There was study conducted by researchers in WIOR. In this study, countries from three groups were included. In this study, from the highly dependent group of countries, Mauritius and Seychelles were included, and from the second group of medium-high dependent countries, Madagascar, Mozambique, Tanzania, and Comoros were included. In addition, from medium dependent countries, Kenya and South Africa were included. This study found out that dependence of these countries can be different; however, the dependence of coastal communities on fisheries and seafood is extremely high. Fisheries and seafood problems emerging due to climate change and other factors makes the coastal communities

[453] Khozema Ahmed Ali, Mardiana Idayu Ahmad, and Yusri Yusup, "Issues, Impacts, and Mitigations of Carbon Dioxide Emissions in the Building Sector," *Sustainability (Switzerland)* 12, no. 18 (2020), https://doi.org/10.3390/SU12187427.

of these three groups extremely dependent. Coastal communities from all three groups, high, medium high, and medium dependent group were included. Therefore, undertaken research considers, the coastal communities of these groups as referent object. The government should take steps to reduce climate change and other variables that are threating their existence.[454] Furthermore, there is conflict going on in many parts of the IOR between states and these coastal communities. Depleting fisheries resources can cause migration of these people to other area, and it has proven that food insecurity is a major cause migration and political instability. [455]

3.8 Competition between State and Non-state actors:

The non- traditional security approach talks about the transnational cooperation in resolving non-traditional security threats: It doesn't deny the possibility of competition among different actors.

In the India Sri Lanka conflict, this is evident. For the Sri Lankan government, fisheries resources are important, because it highly depends on fisheries and seafood resources. In contrast, for the Indian state, fisheries resources obtained from the Palk bay don't play a very important role on the national level. Furthermore, the contribution of fisheries and seafood obtained from the Indian Ocean is decreasing, and the contribution of aquaculture is increasing. Therefore, Sri Lanka has appointed a navy to stop the encroachment of fisheries and seafood resources. The Sri Lankan navy on many occasions killed Indian Fishermen; however, India didn't appoint its navy in response. Here is also conflict happening between the non-state actors and the Sri Lankan government. For the Indian government those resources might not be important; however, for the Indian Fishermen fish in the Palk bay, those resources are vital for their survival.

There are two more prominent fisheries and seafood conflicts that are between India and Pakistan, and India and Bangladesh. The conflict between India and Pakistan is not for fisheries resources. However, security agencies of both countries has deployed resources there to stop encroachment of fishermen. The real issue between India and Pakistan is the issue of sovereignty; nevertheless, the area is very fertile ground for fisheries and seafood resources. Both the countries arrest hundreds of fishers to proclaim sovereignty.

The Bay of Bengal remains another fisheries and seafood conflict in the IOR. The coastal population is more dependent on fisheries and seafood than the population of the rest of a country.

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[454] Sarah F.W. Taylor et al., "Measurement and Implications of Marine Food Security in the Western Indian Ocean: An Impending Crisis?," *Food Security* 11, no. 6 (2019): 1395–1415, https://doi.org/10.1007/s12571-019-00971-6.
[455] Ahmad Sadiddin et al., "Food Insecurity as a Determinant of International Migration: Evidence from Sub-Saharan Africa," *Food Security* 11, no. 3 (2019): 515–30, https://doi.org/10.1007/s12571-019-00927-w.

According to one study, the coastal population eats average per capita consumption 15 times higher than other populations. They don't follow any regulations mechanism. There is also conflict happening between Tanzanian Fishermen and the government are having violent clashes over fisheries and seafood resources. There are also incidents of competition between industrial and local fishing industry.

Conclusion:

The demand for fisheries resources will increase, while their stock is declining and will decline due to many factors. The governance mechanism is still insufficient in meeting challenges emerging in IO for fisheries and seafood resources due to non-cooperation of some countries. Therefore, competition for fisheries resources will remain. However, it can become a non-traditional national security threat. The coastal communities of three groups are extremely dependent on fisheries resources make these countries more vulnerable.

Chapter 4: Fisheries Resources and Pakistan

4. Challenges and Opportunities for Pakistan

Pakistan has a long coast line and exclusive economic zone of thousands of Kilometers. Pakistan is rich in fisheries and seafood resources. Due to the coming challenges, fisheries resources are declining, and there is the possibility of competition among countries for fisheries and seafood resources. Pakistan is among self-sufficient countries in terms of fisheries and seafood; therefore, it has lots of opportunities to export fisheries and seafood resources. Although Pakistan has great opportunities to benefit from fisheries and seafood resources, Pakistan couldn't not achieve its full Potential due to many challenges. [456] Decline of Fisheries resources can also become a non-traditional security challenge for Pakistan.

This chapter explores challenges and opportunities available to the Pakistani fisheries and seafood industry. First, it discusses situation of food security situation and role fisheries sources can play in eradication, then it talks about the opportunities in export. In addition, this chapter gives information about challenges to fisheries industry, then it highlights challenges to fisheries communities due to different variables. Furthermore, chapter explores the way fisheries and seafood can become a security challenge for Pakistan.

4.1 Eradication of Malnutrition and Fisheries resources

Food security remained a great challenge for the Pakistani state. In the survey of 2019-2020, Pakistan Social and Living Standard highlighted the grave problem of food insecurity in Pakistan. According to this survey, 16 out of 100 people, during the period of the survey, reported lack of food security. According to the report of a food and agriculture organization, 20 percent of people in Pakistan are facing undernourishment. In other words, 440000 people are facing the problem of under-nourishment. For the progress of a country, a healthy population plays a great role. A healthy population is an element of power; hence, it has a central role in the progress of a country. In addition, it creates a burden on the national health system. [457]

In 2021, in the Islamabad security Dialogue, the government of Pakistan defined security in a border manner. The Pakistani state started using a comprehensive definition of security. According

[456] Shah et al., "An Economic Analysis of the Fisheries Sector in Pakistan (1950-2013)."

[457] Phoebe Sleet, "Food Security in Pakistan: Surplus Food Is Not Enough to Create a Food Secure Country - Future Directions International" (Perth, 2019), https://www.futuredirections.org.au/publication/food-security-in-pakistan-surplus-food-is-not-enough-to-create-a-food-secure-country/.

to this definition, human security and traditional security both are important. Furthermore, they mentioned food security as an important element of national security. It means that Pakistani national gave food security as an element of national security, even though it is not existential threat. However, they focused on land based resources, albeit ignoring fisheries. [458] The National Food Security Policy given by the government of Pakistan mentions the importance of diverse food, and in the list of diverse food, they included fruits, nuts, pluses, and livestock products. They completely ignored fisheries and seafood; however, in the same report, they mentioned lack of nutrients such as Vitamin A and Iron. Fisheries and Seafood are an excellent source of Iron and Vitamin A. This shows a complete lack of knowledge related to fisheries and seafood. [459]

Pakistan traditionally remained a land ordinated country. The majority of the Pakistani population lives in land base areas. Punjab is the biggest province of Pakistan, and it doesn't border any ocean. The non-traditional security approach talks about the role of non-state actors in securitization of certain commodities. The coastal population does not play an important role in politics as compared to the land based province. Furthermore, the majority of policy makers are from land based provinces. Besides, above mentioned reasons, it can be because of preference of people, because the Pakistani people don't have fisheries and seafood as their favorite food. The per capita consumption of fisheries and seafood is less than 4 kg, and Pakistan is among the few countries in IOR where the consumption of fisheries and seafood decreased in the last 7 years shown in chapter 2. However, the per capita supply of seafood and fisheries and seafood is also low in Pakistan that is around 2 kg despite being a self-sufficient country in the production of fisheries and seafood. [460]

In terms of opportunities, Pakistan can benefit from fisheries and seafood resources in two ways. In the first manner, Pakistan can utilize fisheries and seafood in a better way to eradicate malnutrition among its population. According to report of Food Security Ministry of Pakistan, 18 percent of Pakistani population is facing undernourishment, 45 percent stunting, wasting 15 percent, and underweight 30 percent. Obesity is also a food security challenge, still the ministry didn't have any findings about it. [461]

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[458] The National Security Committee's Advisory Board, "Islamabad Security Dialogue | Page 1" (Islambad, 2021).
[459] Fazal Abbas Maken and Sikandar Hayat Khan Bosan, "Nutrition Country Profile 2018: Pakistan," *Government of Pakistan Ministry of National Food Security and Research Islamabad* (ISLAMABAD, 2018).
[460] Memon, "Fish Consumption in Pakistan Lowest in the World."
[461] Fazal Abbas Maken and Bosan, "Nutrition Country Profile 2018: Pakistan."

Fisheries is an amazing source of protein, and it can play an effective role in eradicating hunger and nutritional deficiency. It has important minerals such as zinc, protein, vitamin-D, and many other minerals that can play a key role in making the population healthy.[462] A healthy population is a productive population. Numerous researches have proved that there is a strong connection between a healthy diet and productivity. Even some studies have suggested that there is a strong link between eating fish and productivity. According to one study that was conducted in the US concluded: The US can get a benefit of 114 billion $ every year with healthy eating in terms of medical savings, productivity, and prolonged life. This diet is not just based on fisheries and seafood; however, this study proves the importance of healthy eating for the progress of the country.

4.2 Exporting Fisheries Resources

The second way, Pakistan can get benefit from fisheries seafood resources is through providing indirect food security to thousands of people. Pakistan can export fisheries and seafood resources. Currently, Pakistan is exporting around 250 million dollars fisheries and seafood that is well below its true potential. In the chapter 2 and 3, undertaken research found out that fisheries and seafood the demand for fisheries resources is going to increase due to number of factors. The first reason for increase in demand is the increase in the world's population. With the population increase, Pakistan can utilize its fisheries and seafood resources to meet growing demand.

Increase in the middle class is going to be another factor that is going to increase the demand for fisheries and seafood. Pakistan can utilize this demand for fisheries and seafood to export fisheries and seafood resources. [463]

In the second chapter, undertaken research found out that there are many countries that rely on export to meet the demand for fisheries and seafood. In the IOR there are many countries that don't have self- sufficiency. Specifically, medium dependent countries don't have fisheries and seafood resources. However, these countries are also among the poorest in the world and don't have enough resources to import fisheries and seafood resources.[464] Highly dependent countries such as

[462] Ben Belton and Shakuntala Haraksingh Thilsted, "Fisheries in Transition: Food and Nutrition Security Implications for the Global South," *Global Food Security* 3, no. 1 (2014): 59–66, https://doi.org/10.1016/j.gfs.2013.10.001.

[463] Kiran Nazir et al., "A Study on Exports of Fish and Fish Products and Their Role in Economic Growth of Pakistan," *International Journal of Marine Science* 4, no. 64 (2014): 1–4, https://doi.org/10.5376/ijms.2014.04.0064.

[464] Nazir et al.

Indonesia is the second largest exporter of seafood in the world. Furthermore, it is shifting its reliance from fisheries and seafood towards aquaculture. Besides, Malaysia is another country that relies heavily on fisheries and seafood for meeting the demand for people of its countries. Moreover, it is not self-sufficient in the production of fisheries and seafood. It means that Pakistan can select Malaysia as an opportunity. Pakistan is already exporting fisheries and seafood to Malaysia. [465] Fisheries demand will increase that's why Pakistan can benefit from fisheries resources, provided that Pakistan can utilize these resources effectively. [466]

4.3 Challenges to Pakistani Fisheries and seafood Industry

There are lots of challenges the Pakistani fishing industry is facing right now. One of these challenges is the declining fishing resources of Pakistan. Fishing vessels have been increasing in Pakistan for many years. According to one report, Pakistani fishing catch declined 10 percent. Most of the commercial fishing stocks of Pakistan have depleted, and even 10 species have reached their limit. Pakistani coastal communities depend on the production of these species. Furthermore, these species are the source of indirect income for many Pakistani people. Therefore, their decline can pose a great risk, because the oceans' ecosystem depends on each other, so depletion of one species can harm other species as well. Consequently, it is going to harm the Pakistani fishing industry, and those people that are dependent on the fishing industry.[467] One of the most valuable species of the Pakistani fishing industry, shrimps that earn a yearly income of 48 million dollars are facing the threat of extinction.

The decline of catch poses another challenge that is the challenge of profitability. The decline of species forces fishermen to go a long distance to catch fisheries and seafood. Therefore, it utilizes more fuel that's why without subsidy it becomes hard to earn profit from the fishing industry. Subsidies can become harmful for the environment and sustainable fishing practices, thereby the government can give huge subsidies to fishermen. [468]

Climate change is going to impact Pakistan as well. According to the report of Ministry of Climate Change Pakistan, the temperature in Pakistan will rise more than global average. According to this

[465] Nazir et al.
[466] Pawan Patil, David Kaczan, and Shaukat Hussain, "Revitalizing Pakistan's Fisheries," *Revitalizing Pakistan's Fisheries* (Washigton, DC, 2018), https://doi.org/10.1596/30156.
[467] The Fish Site, "Pakistani Seafood Prices Fall in World Market | The Fish Site," The Fishsite, 2018, https://thefishsite.com/articles/pakistani-seafood-prices-fall-in-world-market.
[468] Site.

report, coastal areas are including in those areas where the situation of drought is high. It also predicated estimated 1.6 -1.7 degree Celsius rise in the ocean temperature.[469] The rise in Ocean temperature above can increase process of ocean acidification. Consequently, it will destroy fisheries and seafood species, and it will decrease oxygen level in the Ocean. In addition, these are the areas where frequently drought happens. Therefore, coastal communities are at the risk and a referent object. [470]

Climate change is another threat that is going to harm our fishing industry. As climate change will change the composition of the Ocean's water, it is going to destroy fisheries and seafood species in the world. Climate change will impact cold water species, and they will migrate to other places. Additionally, climate change is going to change the reproduction rate of fisheries and seafood species available in the Pakistani waters. Decrease in fisheries production will decline the catch rate as well as profitability. It will put thousands of people that rely on fisheries and seafood at the risk of poverty.[471] Poverty will impact people's economic access to food, thereby increasing food insecurity. Climate change is an issue where the Pakistani government can do little about it. Furthermore, Pakistan is among the countries that produce little carbon, and their carbon footprint is negligible. However, Pakistan is among the most affected countries. In Pakistan, the discussion revolves around protecting the land based resources from adverse effects of climate change; nonetheless, there is little policy direction about protecting the ocean, and its resources. Furthermore, coastal communities don't become part of the narrative related to the adverse impact of climate change.[472] According to one estimate, seven hundred thousand people are attached to the fisheries and seafood industry in Pakistan, and the average size of a Pakistani family is around 7. It means that the future of 7*700000 people are at stake. At the national level, they don't become a very large portion of our population; nevertheless, their importance becomes visible in the provincial context. [473]

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[469] Ministry of Climate Change Pakistan, "Climate Risks and Food Security Analysis : A Special Report for Pakistan" (Islambad, 2018), https://reliefweb.int/sites/reliefweb.int/files/resources/Climate_Risks_and_Food_Security_Analysis_December_2018.pdf.

[470] Patrick Pringle, "Effects of Climate Change on 1.5° Temperature Rise Relevant to the Pacific Islands," *PACIFIC MARINE CLIMATE CHANGE REPORT CARD Science Review*, 2018, 189–200, https://reliefweb.int/sites/reliefweb.int/files/resources/12-1.5-degree-temperature-rise.pdf.

[471] Asian Development Bank, "Climate Change of Pakistan" (Singapore, 2019).

[472] Bank.

[473] Bank.

There is another environmental problem that is damaging fisheries resources is emerging due to human activity on the land. Mangrove's population has been destroyed at a massive scale. The area of mangroves has reduced from 1850 million square miles to 100o million square miles.

Mangroves play a very important role in the growth of fish species such as shrimps. Moreover, Mangroves play an important breeding ground for fisheries and seafood resources including commercial species, shellfish, and crustaceans. Furthermore, it provides nutrients for many fish species that helps in growth of fish population. According to one estimate, they are home to 25 fish's species.[474] Two important species Palla and Dangar have completely vanished. In 1986, the catch of these two species was 600 tons. The catch of shrimps is decreasing as well. For example, the share of Sindh in the national catch of shrimps has decreased from 97 percent to 92 percent. The loss of mangroves won't be the only variable behind this; however, with the reducing size of mangroves, the value of most prized species is decreasing as well. It shows a connection between these two phenomenons.

The growth of Mangroves depends on fresh water resources, and the main source of fresh water in Sindh is Indus River. Due to the agricultural needs of the province, the government has built many storage facilities that supply water for agricultural needs. These storage facilities are impacting the nutrients level present in the water. Furthermore, due to the use of fertilizers, the water that reaches mangroves does not remain fresh, thereby impacting mangroves growth. Consequently, it impacts the growth of fisheries and seafood. Mangroves in Karachi are facing threat from land grabbing, and people also cut them for timber. In Karachi, around 0.2 million to 0.4 million worth of mangroves wood cut down every day. Pakistan navy start mangroves plantation campaign every year to save them from disappearing; however, one institution can protect them. A national effort is required to protect the national treasure.

Pollution is damaging fisheries resources in Pakistan as well. The biggest city of Pakistan is located in a coastal area.

With the environmental challenges, there are some man made challenges that are destroying fisheries and seafood resources in Pakistan. Illegal and unregulated fishing in Pakistani waters is posing a great challenge to Pakistani fishing resources. Fishing communities are adopting the destructive fishing practices that are decimating the fish population and decreasing biodiversity.

[474] IUCN-Pakistan, "Mangroves of Pakistan - Status and Management" (Islambad, 2005).

One of these practices is aboding the fishing gear. After using the fishing gear, fishermen leave their gear there. This practice plays a role in destroying fishing habitat. According to one report, this type of gear is responsible for hurting 66 percent of fisheries and seafood species. This gear is mostly made up of plastic, and it damages all the ecosystem. Furthermore, plastic takes centuries in destruction; therefore, it becomes very dangerous. Due to mismanagement of the provincial government, sewerage water is directly becoming part of the Ocean in Karachi, and the city has the capacity to treat very small quantities of water.

Marine pollution is also a challenge that the Pakistan fishing industry is facing. The Pakistani coastline is facing a massive challenge of pollution that is impacting marine life, fisheries, and seafood productivity. The first kind of pollution is happening because of human activities around the coastline. There are a lot of projects going on that hamper fisheries and seafood growth. This pollution is mainly due to human activity along the coastline. There is another type of pollution that is affecting marine life is Industrial pollution. The industrial waste along the coastline is becoming part of the marine environment. Furthermore, this industry became part of the marine industry without any treatment. This industrial waste has poisonous metals such cd, cr, cu, As, and many other heavy metals. These poisonous materials destroy marine life along the coastline. This pollution is also happening due to the Karachi port. [475]

After industrial pollution, the pollution that is happening due to the oil refineries and oil transportation is also becoming the cause of industrial pollution along the coastline. According to one estimate given by the ministry of environment, 90,000 tons of oil discharge becomes part of the oceans.[476] Pakistan has a prominent place in the ship breaking industry. Shipping breaking industry is also a main source of pollution along the coastline. All these industries play a role in destroying fisheries and seafood along the coastline. However, data related to their impact on fisheries is not available. Furthermore, there is a lack of studies that can specifically highlight the impact of pollution of marine life.[477]

There is another challenge that our fishing industry is facing is its underperformance as compared to other regional countries. The export of fisheries and seafood products become an indirect source of food security; furthermore, it upgrades the living standards of people. The main reason for

[475] IUCN-Pakistan.
[476] United Nations, "The Enviorment and Climate Outlook of Pakistan" (Islambad, 2013).
[477] Nations.

fisheries underperformance is the lack of policy making and implementation related to aquaculture. Pakistan heavily relies on marine capture for the production of fisheries and seafood.[478] Meanwhile, regional countries are investing in aquaculture to reduce the burden on their marine resources. In contrast, Pakistan is still focusing on marine capture that contributes to declining fisheries and seafood resources. In addition, fishermen go to a long distance for the catch, then fisheries and seafood don't become profitable. Besides, they become poor and become victims of food insecurity.

In 2018, Pakistani fishing exports went up 27 percent, and it added 451 million in national exchequer. However, Pakistani fishing exports are facing massive challenges. First of all, Pakistan is producing low quality fish, thereby fetching the lowest price. The reason for the low price of Pakistani fish is the decline of seafood resources. Pakistani fish in the international market is getting a price of 2.5 dollars, while fish from other countries get an average price of 7 dollars. [479]

The second issue Pakistan's fishing industry is facing is that it can't compete with other countries such as India. [480]The European Union is the one of the biggest importers of high quality fisheries and seafood. The countries in the EU have the highest per capita consumption of fisheries and seafood in the world, because the majority of their population lies in the middle class. The EU removed the ban on Pakistani fishing exports but the Pakistani fishing industry couldn't compete, because India is dominating the fishing market.

The impact of fish decline is harming the prospect of fishing export. Therefore, it is the need of the hour to shift Pakistani industry focus from marine capture to aquaculture so that Pakistani fishing stock can recover. In this way, Pakistani fishing products can compete in the International market. Furthermore, it will increase the profitability of the Pakistani fishing industry. It will improve the living standard of fishermen as well as become a great source of revenue for the Pakistani economy. This is going to be the most important step in reviving the Pakistani fishing resources.

In 2015, the government of Pakistan, and FAO published a report that discusses different challenges faced by the Pakistani marine fishing industry. In the stock assessment they highlight a few important points:

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[478] IUCN-Pakistan, "Mangroves of Pakistan - Status and Management."

[479] Shaid Shah, "Pakistan Fish Exports up 27.94pc, Netting $451.026 Million in FY18," The News, 2018, https://www.thenews.com.pk/print/362151-pakistan-fish-exports-up-27-94pc-netting-451-026-million-in-fy18.

[480] Shah.

(i) They observed that the size of fish is decreasing due to overexploitation of fisheries and seafood. This big size individual species have declined due to this.

This is impacting the profitability of fish has declined due to this fact. As mentioned above, Pakistani fish is getting an average price of three dollars, while the regional countries are getting an average price of 7 dollars. [481]

(ii) The second disturbing finding is that the ecosystem of Pakistan is in danger, because jellyfish are appearing in our water, and jelly fish eat little fisheries. Furthermore, it eats shrimps (economically important for Pakistan). Therefore, urgent steps are required to counter it.

Jelly fish presence is dangerous because our fishermen don't catch them and consider them valuable. They are also a threat to the stock rebuilding.

(iii) This report also showed due to ecosystem disturbance small species are taking over our waters. They are disturbing our whole ecosystem and chances of an economically viable fishing industry.

In the stock assessment, this report finds another disturbing finding that fisheries that are near bottom are near depletion. [482]

There is another strange phenomenon that is happening in Pakistan is that the local fishing fleet is continuously growing despite many experts warning that fishing resources of Pakistan are depleting. The production of Pakistan from marine capture is stagnant, however, the size of the fleet is increasing. It means that overfishing is happening in Pakistani waters; thus, the big size fisheries are declining and low yield fisheries are caught. It is disturbing our ecosystem. This report came in 2015, and it has been 6 years since the government knew of the threat to marine fisheries, nonetheless, they are unable to take any steps to stop this trend that is still continuing.

According to Dr. Zafar, who was appointed by the prime minister as a head committee to monitor marine life in Pakistan, there are some serious issues related to marine pollution. Marine pollution is threatening biodiversity.[483] Orthodox fishing Techniques have destroyed marine life in Pakistan. Industrial pollution is becoming a threat to ocean resources in Pakistan. Furthermore, he added

[481] United Nations Food and Agricuture Organization and Marine Fisheries Department Governent of Pakistan, "Food and Agriculture Organization of the United Nations," 2015, https://doi.org/10.1016/B978-0-12-384947-2.00270-1.

[482] Organization and Pakistan.

[483] Zafar Inam. Zoom Interview

that Jellyfish have started appearing in our waters. It means that they have change the composition of our water. In addition, he said that Pakistani fishermen don't have any idea about what to do with them. There are so many issues faced by the fishing industry. Fisheries stocks have depleted. Pakistani fishing boats are not equipped with modern technology. Some fish need immediate freezing, and they rot before reaching the processing unit. The situation of hygiene where these fish are processed is in abysmal condition. Therefore, Pakistani fishing is getting less price in the international market. He further added that data availability is such a big issue. The Real data is not available. On the question of provincial coordination, after the 18 amendment, he said that yes, fisheries come under the provincial management after the 18 amendment. He said that till 12 nautical mile it is a provincial subject. There is always conflict between different institutions on the boundaries of the ocean, and they even fight and open fire on each other. There are so many people who don't work. Besides he said that reliable data is not available in Pakistan. The government departments don't have reliable data. The Meta data, the ways data is collected, are faulty. On the one hand they were saying that 80 percent of fish stock have depleted, then they said that trawlers are increasing as well.

According to Pakistan maritime security Agency, a few Indian vessels try to fish in Pakistani waters and the agency apprehends them. By and large the situation is not like the South China Sea and our control is much better.[484] Furthermore, the maritime security agency replied that financial cost by the Indian Fishermen is so low that we don't even need to measure it. There is 24 four hour patrolling through radars, and Aerial surveillance. They are repelled at the early stage of their crossing. There must be minor damages, but it is not a damage that we measure the financial cost of. The maritime agency has been controlling things for the last 3 to 4 years. Furthermore, the maritime security agency replied that it is not. There are no licenses given to any country. It further said agency replied that first of all bad nets, small size nets, are the main reason behind it. They catch juvenile fish, which are yet to reach a good size. Due to this reason, the whole process of growth hinders. Due to this reason the whole species became extinct. Sometimes they catch those species that they are not allowed to catch. According to the maritime security agency, it destroys the ecosystem and balance of species. Because it is a cyclic process. Illegal, unregulated, overfishing in many concentrations destroying the economic benefits. Yes, we need to stop using bad nets, techniques and should refrain from fishing in marine protected areas. In addition, the

[484] Maritime security Agency. Whatsapp Interview

agency replied that legislations are enough not that they are complete but writing things on paper is not enough, issues are implementation and enforcement. We can make many policies. We can make a deep sea fishing policy. We can improve management of our zones.

All these issues are not going to impact the Pakistani state, as they are going to impact the coastal communities of Pakistan. They can consider a referent object and their security is facing threat. Pakistan comes in the group of medium dependent countries as shown in chapter 2. As shown in the chapter three coastal communities of this group are extremely dependent on fisheries and seafood; therefore, special policies should be formulated to reduce risk of these communities. There is also possibility of more encroachment from the Indian Fisherman, because their coastal communities are also extremely dependent on fisheries and seafood resources. Hence, competition between Pakistan and India for fisheries and seafood resources can increase as well.

4.4: Decline of Fisheries Resources: A NON Traditional National Security Threat for Pakistan

As described above food security can become a national security challenge when there is a problem in the production. The coastal communities of Pakistan heavily depends on fisheries and seafood resources for food security. There are many countries that are not self -sufficient in the production of fisheries and seafood; however, they fulfill their needs through export. In case of Pakistan, full filing need through imports remains a challenge because of poverty and low income of the people. Decline of fisheries resources due to number of factors poses a challenge to fisheries resources in Pakistan and interaction of different variables can make it a non-traditional security challenge for Pakistan.

Fisheries resources are declining in Pakistan due to myriad of factors such as overfishing, illegal fishing methods, un-regulated fishing activities, pollution, and poor governance. Decline of fisheries resources will also exacerbate due to climate change. [485]

Overfishing remained a challenge in Pakistan. Due to overfishing, fisheries resources of Pakistan are declining. All kinds of fishing vessels are increasing in Pakistan while fishing resources are declining, thereby creating challenges for coastal communities. A significant decline was observed in fisheries and seafood resources in the recent survey. According to stock assessment survey,

[485] Amin Ahmed, "Why Our Fisheries Are Underperforming - Newspaper - DAWN.COM," Dawn, 2021, https://www.dawn.com/news/1468760.

fisheries and seafood resources of Pakistan have declined to one third of the previously possessed resources.

Fisheries species: croakers, Catfish, ribbonfish, shark and rays were not found in Pakistani waters. There species were available in abundance in previous such surveys. This survey also showed disturbing signs of eco-system disturbance. This survey was conducted by FAO and WWF Pakistan. Fish species such as shark and taxa were not fit for the commercial use. This decline is disturbing because it will lead to further deterioration of fisheries and seafood resources. When fishermen catch size declines, fishermen will catch more fisheries to compensate the size of fisheries. It will completely decimate fisheries and seafood resources. Decline of fisheries resources is because of illegal and unregulated fishing methods.[486] There is a nexus between poverty and overfishing in Pakistan, which is creating a cycle of problems.[487]

Illegal fishing is a big problem in Pakistan. Pakistani fishermen are mostly poor, and they use a type of fishing methods that is decimating fisheries and seafood in Pakistan. Fisheries and seafood resources have reached to its limits and the sign of eco-system disturbance are also visible. Fishermen are not even ready to accept their fault in disturbing the eco-system. [488]

IIU and decline of fisheries resources can cause non-traditional security challenge. Illegal fishing can become a non-traditional security threat in five ways. It facilitate transnational crimes such as money laundering, forgery, corruption, and many other things. These illegal fishing activities are also pose a threat to economic security, food security, and also exacerbate eco-system degradation. These issues can threaten national and regional security. [489]

A majority of IOR states are developing countries, and the situation of governance is not up to the mark. As a result, it become easy for transnational criminal organizations and terrorist organization to hide themselves under disguise of Illegal fishing. These issues can become challenge for Pakistan as well for coastal communities, those who rely exclusively on fisheries resources, won't have fisheries and seafood resources then they can become part of these criminal networks and can

[486] Ahmed.
[487] Shahrukh Rafi Khan and Shaheen Rafi Khan, "Fishery Degradation in Pakistan: A Poverty-Environment Nexus?," *Canadian Journal of Development Studies* 32, no. 1 (2011): 32–47, https://doi.org/10.1080/02255189.2011.576140.
[488] Khan and Khan.
[489] Alyssa Withrow, "5 Ways IUU Fishing Threatens National Security - American Security Project," American Security Project, 2021, https://www.americansecurityproject.org/5-ways-iuu-fishing-threatens-national-security/.

become a non-traditional security challenge. There is a strong connection between terrorism and food insecurity.[490]

There is a link between terrorism and food insecurity. Food insecurity can increase threat of terrorism, as food is a basic need of human beings. Food insecurity creates anger against the government, and people wants to take action against the government. It impacts psychology of people. Terrorist organizations take advantage of these grievances and motivates people against the government by reducing the problem of collective action. According to the study, food insecurity had bad impact on the peace of the world during the period of 1980 to 2011. [491]

Decline in fisheries resources also impacts employment opportunities for coastal communities. There is also a link between domestic terrorism and unemployment in youth. Region of the world, North Africa, where 40 percent of terrorist incident happened between 2011- 2015, the rate of unemployment was more than 30 percent. There is also a United Nation Security Council resolution underlined the threats posed by the radicalization of youth, and it highlighted unemployment as main cause of radicalization.[492] Therefore, it is important to understand the risk posed by declining fisheries resources in Pakistan.

Declining fisheries resources lead to terrorism is clear in the case of Somalia. Foreign fishing vessels were illegal fishing in the waters of Somalia that led to decline of fisheries and seafood resources in Somalia. Therefore, many people in Somalia were unable to feed their families. It led to terrorism and piracy. Terrorist organization Al Shabab took advantage of the situation and established linked with piracy networks. The money obtained from piracy was used to sponsor terrorist activities in Somalia. [493]

Small scale fishing vessels can also be used by other state actors to sponsor proxy elements inside a country. Small fishing boats are a better means for these kind of activities. Saudi authorities apprehended a fishing boat that was carrying arms for Yemeni rebels. So, coastal communities where unemployment is high, food insecure and lack of opportunities can become a breeding

[490] Withrow.

[491] Nisha Bellinger and Kyle T. Kattelman, "Domestic Terrorism in the Developing World: Role of Food Security," *Journal of International Relations and Development* 24, no. 2 (2021): 306–32, https://doi.org/10.1057/s41268-020-00191-y.

[492] Aniruddha Bagchi and Jomon A. Paul, "Youth Unemployment and Terrorism in the MENAP (Middle East, North Africa, Afghanistan, and Pakistan) Region," *Socio-Economic Planning Sciences* 64, no. May 2017 (2018): 9–20, https://doi.org/10.1016/j.seps.2017.12.003.

[493] SAMANTHA D FARQUHAR, "When Overfishing Leads To Terrorism," *World Affairs: The Journal of International Issues* 2, no. 2 (2017): 68–78, https://www.jstor.org/stable/48531463.

ground for non-traditional security challenges especially in a country such as Pakistan which remained a victim of foreign sponsored and domestic terrorism. [494]

Pakistan is moving towards Blue economy and China Pakistan Economic corridor is crescendo of blue economic policy. To make China economic corridor successful peace is a basic requirement. There were many attacks on security personals and Chinese citizen in Baluchistan. Indian involvement is visible in these attacks. CPEC is the part of Belt and Road initiative. India and the US didn't accept this project as an economic project, instead, they see it as a strategic project. Therefore, they security threats for Pakistan are increasing in Baluchistan especially in the coastal region because it is a project of Blue economy and connectivity with the ocean is the most important element of it. [495]

Many foreign news organization such as DW reported that Chinese fishing vessels are prepared to take fishing resources of Pakistan. They quoted a local person that was saying that china is taking over our waters. Undertaken research mentioned in chapter three that fisheries resources are declining in all over the IOR. There are multiple reasons for it. Fisheries resources of Pakistan are declining because of overfishing and illegal fishing methods. When Fisheries resources will decline beyond the point of recovery and coastal communities won't be able to sustain on these resources then they will consider Chinese presence as the reason behind it. There are many articles related to Chinese occupation on fisheries resources of Pakistan. These articles are mainly targeting coastal communities so that they can raise their voices against the Chinese investment. [496]As mentioned above, food insecurity can create grievances, and terrorist organization use these grievances to obtain their aim. Therefore, due to interaction of these factors, declining fisheries resources can pose a non-traditional security sponsored by state actor. Declining fisheries resources, illegal fishing, illegal fishing gear, and climate change with the help of foreign propaganda can create challenges for Pakistani goal of becoming a bridge between Africa and Eurasia. Therefore, it is imperative to make policies to stop decline of fisheries resources and provide alternative opportunities to these people.

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[494] Thom Shanker and Robert F. Worth, "Yemen Seizes Boat Suspected of Smuggling Iranian Arms - The New York Times," The New York times, 2019, https://www.nytimes.com/2013/01/29/world/middleeast/29military.html.
[495] Riski Sulistiarini Tiara Dewi, Muhammad Amir Masruhim, "Pakistan's Untapped Blue Economy Potential," *Journal of Global Peace and Security Studies* 2, no. 1 (2021): 5–24.
[496] S. Khan, "Pakistan: China′s ′involvement′ in Deep Sea Fishing Angers Local Fishermen | Asia | An in-Depth Look at News from across the Continent | DW |," DW, 2020, https://www.dw.com/en/pakistan-chinas-involvement-in-deep-sea-fishing-angers-local-fishermen/a-55274723.

Conclusion:

In the light of above mentioned facts, fisheries and seafood communities can face threat due to fisheries and seafood resources, because they rely on fisheries and seafood for direct and indirect food security. As mentioned in the chapter 3 that climate change is impacting fisheries resources. The rise in the Ocean temperature is changing chemistry of the Indian Ocean. It will further decline in the future. There are also internal challenges such overfishing and increasing fishing fleet and declining profitability combining with their deplorable conditions of living. So, there existence is certainly in threat if the right measure were not taken. Even they do not have proper health facilities. Therefore, it is evident that their security is in danger. Consequently, it will increase competition between the Pakistani state and non-state actors, and there is also possibility of increasing encroachment from the Indian Fishermen. Therefore, competition for fisheries resources is still a possibility. Pakistan can also benefit from fisheries resources by improving the issues it is facing. It can also become a non-traditional Security threat for Pakistan.

Conclusion, Findings and Recommendations

Fisheries and Seafood are an important component of food security in IOR. There many state and non-state actors that depend on fisheries resources for food security. Fisheries are sources of food security in both direct and indirect way. They are an immense source of protein for many countries. However, there are lots of challenges emerging for fisheries and seafood.

There are lots of factors that are going impact fisheries and seafood availability and can create possibility of competition among Indian Ocean countries. These factors including population and Middle Class increase, Climate change, Overfishing, Illegal and unregulated fishing, and lack of governance. Climate change is going to impact the productivity of the Indian Ocean. It will change the nature of it, and it could be a threat to the state that rely on fisheries and seafood for food security. The Indian Ocean temperature witnessed an increase of 1 degree Celsius every year from 1951- 2015. The Indian Ocean temperature rose 0.3 degree Celsius more than average world temperature; furthermore, heat content also witnessed an increase in 700 m tropical sea. Temperature rise of 2.4 Celsius is expected till 2040 and temperature rise of 4 degree Celsius is expected till end of this century. Furthermore, *due to urbanization, industrial waste, and other numerous human activities along a coastline are a threat to the marine ecological balance. These practices led to decline in fish stock, or in some cases, complete depletion of fish stocks, and*

disturbance of the whole marine food web. Negative consequences of these practices will be dangerous for coastal communities, and increase the prospect of competition for fisheries and sea food resources. In addition, illegal and unregulated fish catch represent 13 to 31 percent of overall production and in some areas, it represent 40 percent share of overall production. It has a huge impact on some of the world poorest nation. It damages eco system, employment opportunities, food security, and the economy of the poorest and developing nations. The solution of these issues is in improving governance structure.

There are numerous mechanisms for fisheries and seafood. However, there are facing numerous problem due to different reasons. Fisheries governance is important to create to regulate competition for the fisheries and seafood resources in the IOR. Specifically, there are numerous challenges faced by the institutions responsible for providing fisheries and seafood governance in the IOR.

As far as Pakistan is concerns, Pakistan has low per capita consumption of fisheries and seafood. However, there are no challenges emerging for Pakistan due to security competition for fisheries. There are risk to coastal communities of Pakistan. They depend on fisheries and seafood resources. Pakistan can utilize fisheries and seafood in better way to eradicate malnutrition among its population. Fisheries is an amazing source of protein, and it can play an effective role in eradicating hunger and nutritional deficiency. It has important mineral such as zinc, protein, vitamin-D, and many other minerals that can play a key role in making population healthy. A healthy population is productive population. Numerous researches have proved that there is a strong connection between the healthy diet and productivity. Even some studies have suggested that there is a strong link between eating fish and productivity. According to one study that was conducted in the US concluded: The US can get benefit of 114 billion $ every year with healthy eating in terms of medical savings, productivity, and prolonged life. This diet is no just based on fisheries and seafood; however, this study proves the importance healthy eating for the progress of country.

The second way, Pakistan can get benefit from fisheries seafood resources is through providing indirect food security to thousands of people. Pakistan can export fisheries and seafood resources. Currently, Pakistan is exporting around 250 million dollars fisheries and seafood that is well below its true potential.

Pakistani coastal communities depends on the production of these species. Furthermore, these species are the source of indirect income for many Pakistani people. Therefore, there decline can

pose a great risk, because the oceans' ecosystem depends on each other, so depletion of one species can harm other species as well. Consequently, it is going to harm Pakistani fishing industry, and those people that are dependent on fishing industry. One of the most valuable specie of Pakistani fishing industry shrimps that earn a year income of 48 million dollars are facing the threat of extinction. Furthermore, Pakistan has challenge of pollution, increasing fleet, management challenges, governance challenges, and many other things. Pakistani coastal communities comes into group of countries where coastal communities highly dependent on fisheries and seafood resources for food security.

Findings:

- Fisheries and seafood are an important part of food security in many IOR countries. Many countries of IOR rely on fisheries and seafood as main component of food security. They get protein from fisheries and seafood.
- Countries of the Indian Ocean region are divided into four groups in terms of fish consumption.
- The demand for fisheries and seafood is increasing due to many factors such as increasing population, increasing middle class and the production is facing challenges due to overfishing, illegal and unregulated fishing practices, and climate change pollution.
- There are nine countries that will witness an increase in their population. Out of these nine countries, 4 are the part of IOR.
- A half of the world population became Middle Class, and 5 people had been joining the middle class every second till 2020.
- 60 percent of the world population will become part of the Middle class in 2030.
- Fish Consumption is increasing, and FAO is predicting a shortage of protein rich food.
- Majority of stock in the Indian Ocean is at biologically sustain level; however, the percentage of biologically sustainable stock is decreasing, and countries such as Bangladesh, Malaysia, Thailand, Egypt, Pakistan, and many other countries are facing the challenge of decreasing marine stock.
- Illegal and Unregulated and unreported Fisheries are a big challenge to sustainable fisheries in the Indian Ocean.
- The share of illegal fisheries in around 26 million tonnes every years; it's worth around 10 to 26 billion dollars.

- It represents 40 percent share of overall production. It has a huge impact on some of the world poorest nation.
- In the past 60 years, Tuna catch witnessed a 1000 percent rise, due to this reason, scientists show concerns that it won't be able to sustain growing demand. Every years, 6 million tonnes of Tuna become a part of the food market.
- Climate change is posing a great risk to fisheries resources of the Indian Ocean. It is going to change nature, chemistry, production pattern, and even posing a threat to completely eliminate fishing production.
- Coastal communities of three group of countries extremely dependent on fisheries resources; therefore, they are facing more threat than any other group.
- There are many governance structures available in the Indian Ocean; however, they are unable to perform their role effectively due to many reasons.
- Fisheries are not equally part of food security in all countries. Therefore, their response to challenges emerging from fisheries and seafood resources is different. There are different dynamics are involved.
- Competition between state and non-state happening all around the Indian Ocean especially in countries Tanzania, Thailand, Malaysia, and many other countries.
- Decline of fisheries and seafood resources can become a national security threat in many countries such as such as Tanzania, Mozambique, Madagascar, Somalia, Yemen, Comoros, Oman, Bangladesh, India, Seychelles, Mauritius, Indonesia, Thailand and many other states.
- Pakistan can explore and utilize its fisheries and seafood resources. Currently, fisheries and seafood resources are not a big part food security in Pakistan and per consumption of fisheries and seafood is the lowest in the world.
- Pakistan can benefit from fisheries resources in two ways: It can export fisheries and seafood resources, and can use it to reduce malnutrition. However, Pakistan is currently not giving importance to fisheries and seafood in its overall food security equation.
- Pakistani marine fisheries and seafood resources are not facing threat due to external competition. However, competition is still a possibility due to extreme dependence of the Indian coastal communities on fisheries resources.

- Pakistani fishing industry is facing challenges due to internal factor due to poor governance and management.
- Illegal and unregulated methods of fishing are creating massive risks for fisheries and seafood.
- Costal and other forms of pollutions are destroying fish habitat and creating food insecurity among coastal communities.
- Currently, there is no direct threat to the Pakistani state due to fisheries resources from fisheries competition. The Pakistan coastal communities can face challenges due to emerging climate change issues and depleting resources. They don't have basic necessities of life such as clean drinking water, health facilities, and even a clean place to live. Furthermore, fishing stocks are declining and profitability of Pakistani fish is decreasing. In addition, climate change will further destabilize them, and currently, the government institutions don't even have reliable data about the impact of declining fisheries resources and climate on these communities. Additionally, the government is not taking any steps to improve the situation of these people.
- Fisheries resources can become a non-traditional national security threat due to decline of fisheries and seafood resources.

Recommendations:

Pakistan should incorporate fisheries and seafood among the broader narrative of food security. Fisheries and seafood can play an important role in eradicating malnutrition in Pakistan. Currently, food security narrative is focused on land based resources, and there is lack of focus on fisheries resources in food security discourse. Fisheries and seafood can help the government in dealing with problem of food insecurity.

According to Global Hunger Index, the level of Hunger in Pakistan is serious and 25 percent population is undernourished. Fisheries and seafood are an excellent source of protein, vitamin D, and other essential nutrients. Therefore, these resources can help in improving level of malnutrition among the population of Pakistan.

The provincial government of Sindh should take steps to reduce urban pollution and other untreated material from going into sea. Currently, the government has failed to resolve the issue of marine population. There should be implementation mechanism with accountability. There are

lots of international and local regulations related to marine pollution. There is lack implementation on the behalf of government.

The government should show seriousness towards the marine environment. Recently, a ship with 1500 tonnes mercury came and was cleaned on Gadani beach. Despite warnings from many international organizations. The Baluchistan environmental Protection Agency even gave certificate of clearance, and there are reports that Pakistani shipbreaking is famous for cleaning the dirtiest sludge. The government should make an effort to improve working and effectiveness of its institution. There should be a strict accountability mechanism for such practices.

Balochistan costal belt is currently clean from pollution due to less development and population. There are new projects are starting in Balochistan. The government should keep in mind health of marine resources while building new infrastructure around the coastline so that it does not damages fisheries and seafood resources along the coastline. For example a coal power plant was building near Gawadar port, without approval of environmental agency that can damage fisheries resources.

The government should investigate that how despite decreasing catch and profitability new vessels are getting certificate to fish in Pakistani waters. There are numerous reports even a report of the government of Pakistan and FAO that fish size is decreasing and marine fish catch is reducing then government should not give license to new vessels.

The government should develop alternatives for fishing communities on war footing. Marine aquaculture should start in Pakistan, and fishing communities should get fair share in it. There should be more marine protected zones in Pakistan.

Mangroves play an important role in preventing disasters and also provide habitat for fisheries resources. There should be a national effort for growing mangroves. There should be penalties for cutting mangroves. The government should provide alternatives to people that rely on income and use mangroves wood as a fuel. There should be strict actions against people involved in cutting mangroves.

The government should put marine protection tax on those industries, e.g shipbreaking, that are involved in polluting the marine areas and that tax should be used for betterment of fishing communities. The relevant government should take special steps for protection of coastal communities.

The contract system should end, because it exploit local fishermen, as a result, they try to catch more fish. The government should empower local fisher communities.

The government should make its institutions that deals with fisheries more effective. Currently, there are unable to perform their jobs. There are concerns about the authentication of data, they are collecting. The government should take steps with the help of regional fisheries organization in improving quality of data.

The government should take every possible measures to protect coastal communities, and data about them should collected separately. Specific policies formations, and separate steps should be taken for their survival.

The government should take steps to improve per capita supply, and it should take steps to bring people towards fisheries and seafood eating. It can be done through conduction shows in media that raise awareness about fisheries and seafood and its effectiveness.

The government should take steps to build capacity of relevant institutions for enforcing policy measures. Furthermore, it should raise awareness among fishermen about the possible implications of their illegal practices by running special shows on local television. The government should start a local radio station for coastal communities.

Conclusion:

Fisheries resources are declining and due to climate change and many other factors will make fisheries resources a non-traditional national security challenge. Importance of fisheries resources will increase; thus, competition for fisheries resources is possible. Countries in high dependence group such as Maldives, Seychelles, Comoros, and Mauritius face national security risk due to declining fisheries resources due to their high dependence on fisheries resources. Furthermore, the coastal communities of three fisheries groups are facing extreme challenges due to their exclusive dependence on fisheries resources, and coastal communities of Pakistan are included in it, thereby increasing competition between state and non-state actors. Pakistan needs to focus on fisheries and seafood resources to improve the situation of food security, and also there is a need for special kind of policy making for coastal communities. The government must take steps to resolves marine governance issues to reduce level of threat for coastal communities. The government of Pakistan should understand the dire consequence of decline of fisheries and seafood sources.

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Annexures 1: Research Questions:

1. Illegal fishing by foreign fishing vessels is impacting the Pakistani fishing industry?
2. To what extent Indian fishing activities in Pakistani waters costing Pakistani fishing industry especially fishing of Tuna?
3. Has Pakistan given license to any other country for fishing in its exclusive economic zone?
4. How illegal fishing techniques are impacting the biodiversity and fishing resources in Pakistan?
5. What kind of legislation is required on the national level to improving management in the fishing industry in Pakistan?
6. How marine pollution is impacting Pakistani fisheries resources?
7. How Pakistan can improve fisheries profitability**?**
8. How coordination issues between provinces impact fisheries resources?
9. How lack of data impact fisheries management?

Annexures 2

Maritime Time Security agency:

1. **Illegal fishing by foreign fishing vessels is impacting the Pakistani fishing industry?**

One the question whether foreign fishing vessels operating in Pakistani territory, Pakistani maritime agency replied that it is the right of a country to catch fish from its territorial and exclusive economic zone. Whether any foreign fishing vessel encroach in Pakistani area, the maritime security agency replied that a few Indian vessels try to fish in Pakistani waters and the agency apprehend them. By and large the situation is not like the South China Sea and our control is much better.

2. **To what extent Indian fishing activities in Pakistani waters costing Pakistani fishing industry especially fishing of Tuna?**

Encroachment is so low that we don't even need to measure it. There is 24 four hour patrolling through radars, and Ariel surveillance. They are repelled at the early stage of their crossing. There

must be minor damages, but it is not a damage that we measure financial cost of it. The maritime agency is controlling things from last 3 to 4 years.

3. **Has Pakistan given license to any other country for fishing in its exclusive economic zone**?

It is a straight no. There are no license given to any country.

4. **How illegal fishing techniques are impacting the biodiversity and fishing resources in Pakistan?**

On the question that what kind of fishing practices are damaging Pakistani fishing resources. The agency replied that first of all bad nets, small size net, are the main reason behind it. The catch juvenile fish, which are yet to reach at good size. Due to this reason, the whole process of growth hinders. Due to this reason whole specie become extinct. Sometime they catch those species that are not allow to catch. According to maritime security agency, it destroys the ecosystem and balance of species. Because it is a cyclic process…. The mechanism of the whole that Allah has created, we destroy it. Illegal, unregulated, overfishing in many concentrations destroying the economic benefits. Yes, we need to stop using bad nets, techniques and should refrain from fishing in areas where …. Marine protected zones, we should protect them.

5. **What kind of legislation is required on the national level to improving management in the fishing industry in Pakistan?**

Legislations are enough not that they are complete but writing things on paper is not enough, issues is implementation and enforcement. If the enforcement mechanism is not strong, then even if you bring American law, it won't be of any use. We can make many policies. We can make deep sea fishing policy. We can improve management of our zones.

Annexure 3:

1. **How marine pollution is impacting Pakistani fisheries resources?**

There some serious issues related to marine pollution. The marine pollution is threatening bio diversity. Orthodox fishing Techniques have destroyed marine life Pakistan. Industrial pollution is becoming threat to ocean resources in Pakistan. Jelly fish have started appearing in our waters. It means that they have change the composition of our water. Pakistani fishermen don't have any idea about what to do with them. There are so many issues faced by the fishing industry. Fisheries stocks have depleted.

2. **How Pakistan can improve fisheries profitability?**

It is due to the traditional, I would say that they use obsolete methods of Pakistani fishing industry. Pakistani fishing boats are not equipped with modern technology. Some fish need immediate freezing, and they rot before reaching to the processing unit. The situation of hygiene where these fish are processed is in abysmal condition. Therefore, Pakistani fishing are getting less price in the international market.

3. **How coordination issues between provinces impact fisheries resources?**

On the question of provincial coordination after the 18 amendment. He said that yes fisheries comes under the provincial management comes after the 18 amendment. He said that till 12 nautical mile it is a provincial subject. There is always conflict between different institutions of on the boundaries of the ocean, and they even fight and open fire on each other. There are so many people who don't work.

I was in FAO seminar in Islamabad, I gave my presentation and have shared with you

4. **How lack of data impact fisheries management**?

On the question of data availability, He said that reliable data is not available in Pakistan. Data, I must say Meta data is not available, When we ask them about how they get the data they don't have answer. The government departments don't have reliable data. They don't have reliable data related to fish catch and processing. Read the report again, I will tell you what reservation I have about the report. In the meeting, I raised some question. On the one hand they were saying that 80 percent of fish stock have depleted and then saying that trawlers are increasing as well. Does it make any sense? The price of one trawler is around 10 million. Fake data is avaible. You should Dr. Qadwai in Oceanography department. She was with me compiling the report.

You are always welcome to ask me any question, I am always avaible. Even the silliest question can bring big information. So keep asking questions.