



## Public Expenditures and Wellbeing of Fishing Community in Malaysia: A Comprehensive Review

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Article History	Abstract
Received: 06 June 2023 Revised: 05 Sept 2023 Accepted: 14 Oct 2023	<p>The issue of food security has garnered worldwide interest in light of growing apprehensions regarding population increase and climate change on a global scale. Therefore, this review examines the intricate relationship between public expenditures, food security, the sustainability of fish availability, and the overall welfare of Malaysian fishery communities. Given that the fishing industry is a crucial source of sustenance and income for these communities, it is essential to comprehend the intricate relationships between public financial allocations, food security, and sustainable fishing practises. Through a comprehensive synthesis of existing literature, data analysis, and policy evaluations, this review study sheds light on the complex relationships between public expenditures, food security, fish availability sustainability, and the overall well-being of Malaysian fishing communities. The findings of the review disclose the ripple effects of increased food security and sustainable fish availability on the general welfare of fishing communities. It recognises that when public expenditures effectively resolve food security issues, fishing communities experience improved physical health, decreased hunger vulnerability, and increased economic stability. These positive outcomes not only contribute to the immediate well-being of community members, but they also foster social cohesion and pave the way for long-term development. This study seeks to guide policymakers, stakeholders, and practitioners towards informed decision-making that fosters resilient fishing communities, ensures food security, and promotes the sustainable use of marine resources. The study will further help the policy makers to develop strategy to improve the sustainability of fish and the wellbeing of fishing community in Malaysia.</p>
CC License CC-BY-NC-SA 4.0	<b>Keywords:</b> Public expenditure, Fishing industry, Food security, Community wellbeing, Malaysia

### Introduction

In an epoch characterised by unparalleled global problems, the matter of food security has emerged as a paramount concern on a global scale (Panghal et al., 2022). The dual challenges posed by the rapid expansion of the global population and the imminent threat of climate change have emphasised the imperative need to tackle the issue of food security at a worldwide level. The complex nature of this dilemma has expanded beyond specific geographical areas and has now emerged as a critical nexus between environmental sustainability, social equality, and economic stability.

Central to this study is the acknowledgment that the fishing sector serves as a pivotal component within the socioeconomic structure of Malaysian communities (Ricardo, 2023). These communities, which are frequently situated in coastal areas, obtain vital subsistence and generate revenue from the ocean resources available to them. The intricate relationship between the allocation of public finances, the state of food security, and the implementation of sustainable fishing practises is recognised as a pivotal intersection for the overall welfare of individuals and communities. Therefore, this analysis aims to

explore the intricate connections that define these characteristics, providing a more profound comprehension of how efficient distribution of resources can have a beneficial impact on the well-being and prospects of these communities.

Sustainability, especially in regard to fish supply, is intricately intertwined with the broader concept of food security. Fish plays a central position in global food production systems as an indispensable source of protein. The sustainability of this essential resource depends on the responsible management of its utilisation, necessitating careful attention to both ecosystem health and fishery methods. In this context, public expenditures exert considerable sway, shaping people's access to fish resources while simultaneously protecting the delicate balance of marine ecosystems. Due to its high protein content and nutritional value, fish plays a crucial role in global food production systems. To bolster this contribution, the pursuit of sustainable fisheries and aquaculture aligns immediately with global food security and nutrition objectives. Particularly important is the availability of fish resources, which derive primarily from natural marine sources. Moreover, fisheries and aquaculture strategies are an integral part of socio-economic development policies due to their substantial contribution to income generation, especially for small-scale fisheries communities, which are frequently economically disadvantaged. The decline in fish stocks and catches has diminished income and employment opportunities, especially in rural areas (Cmara & Santero-Sánchez, 2019). Béné and Heck (2005), focusing on African nations, emphasised the need for future investments in fisheries not only because of their essential nutritional contribution to human development, but also because of their potential to generate wealth for nations and facilitate effective welfare distribution, especially among vulnerable groups such as women and the poor. Allison (2011) drew attention to least-developed countries and argued that the rise in fish prices alongside other food commodities during the global food crisis of 2007-2008 highlighted the crucial role that fisheries and aquaculture play in ensuring food security and providing essential nutrition, particularly for impoverished communities. Fisher et al. (2017) illuminated the significance of fish as a dietary and economic necessity through a comprehensive study employing large, nationally representative data from twelve of the world's most food-insecure nations. Ten to forty-five percent of the population, according to their findings, relies significantly on fish as an essential part of their diet and source of sustenance. This dependence is most pronounced among households with the fewest assets, highlighting the essential role of fish in sustaining vulnerable communities. In light of this, food security interventions should include terrestrial and marine/freshwater programming to strengthen the foundation of a resilient global food system.

On the other hand, the littoral and marine ecosystems of Malaysia, which play a crucial role in the nation's food security, are facing increasing risks due to the advancing impacts of climate change (Shaffril et al., 2017; Tang, 2019). The current understanding of marine habitats is undergoing revision as a result of heightened carbon dioxide emissions, elevated sea temperatures, ocean acidification, escalating sea levels, and shifting rainfall frequency (Alam et al., 2015; Danylchuk et al., 2023; Suyani et al., 2023; Sharma, 2023; Yusuf et al., 2023). Within this dynamic environment, the habitats of fish, as well as their patterns of migration and reproductive behaviours, are susceptible to modifications. These changes have the potential to impact the distribution and abundance of various species. Ottersen et al. (2006) posit that the potential consequences of elevated temperatures on fish populations include alterations in fish migration patterns, changes in egg incubation duration, and disruptions to spawning activities. According to van der Lingen et al. (2016), it has been suggested that the occurrence of harmful algal blooms caused by dinoflagellates, which have adverse effects on fish populations like sardines, could potentially be on the rise as a result of climate change. According to the findings of Baker et al. (2008), the phenomenon of coral reef degradation and disappearance caused by ocean warming resulting from climate change has been identified as a potential cause for the extinction of specific marine species. Simultaneously, the country is also grappling with the ramifications of rapid population expansion, specifically in metropolitan regions. The process of urbanisation has had a significant impact on various aspects of society, such as supply chains, trade networks, consumer behaviour, dietary patterns, and the rising demand for a wide range of protein sources, including fish (Population Pyramid, 2020). In order to effectively address the challenges posed by these dynamics, it is imperative to possess a thorough understanding of the intricate relationship between the availability of fish, government assistance, and the capabilities of the fishing community.

Therefore, this review study aims to conduct a thorough investigation into the complex interconnections between public expenditures, food security, the sustainability of fish availability, and the overall wellbeing of fisheries communities in Malaysia. Through this endeavour, the aim is to provide significant perspectives that can be utilised in the development of policies and the making of strategic decisions. Ultimately, this will support the growth and prosperity of fishing communities, guarantee the availability of food, and uphold the sustainable management of marine resources. In light of the global uncertainties, the objective of this research is to shed light on a potential approach that may effectively reconcile the varied requirements of communities, the essentiality of environmental preservation, and the obligations of governance.

### **Food security in Malaysia**

Food security has recently grabbed hold of worldwide attention amid increasing concerns about the world population growth and climate change. Thomas Malthus (1766-1834), through his publication-“An Essay on the Principle of Population” at the end of the 18th century, stated that the population growth, if left unchecked, food shortage would happen as population tends to grow exponentially. The food security has set a place in the development policy debate since 1970s (Mellor & Johnston, 1984). Food and Agriculture Organization of the United Nations (FAO) defines the food security as “a condition when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (FAO, 2005). The definition is widely accepted and adopted. Moreover, great works of studies look at the food security in four dimensions, including food availability, accessibility, utilization and stability (FAO, 2008; Aborisade & Bach, 2014; Chariton, 2016; Godrich, et al., 2019). These four elements should be taken into account wholly in formulating a policy package to effectively address the food security issues.

According to Mcclanahan, Allison and Cinner (2013), food insecurity and fisheries conflicts tended to be greater with declining fishery resources, different division in investment for regions, changing consumption patterns, rising dependency on fishery resources for coastal communities, and inescapable poverty traps coming from low net resource productivity and few alternatives. It is interesting to say that FAO (2005) looked with favour upon the improvement of the small-scale fisheries to alleviate poverty and improve food security as well. In particular, government expenditure in fisheries especially in terms of subsidies has gained wide attention because of their relationship with socioeconomic development as well as ecological sustainability (Munro & Sumaila, 2002). The evidence suggests that if subsidies can be effectively utilized, it improves livelihood and resource conditions of those who are dependent on this resource (OECD, 2003). The subsidy for fishing livelihood development as well as resource conservation is considered as one of the important policy tools for the development of rural coastal communities of many countries, including Malaysia.

Ali, et al., (2017) claimed that the development of fisheries should include effective fisheries planning to enhance fish catches and broaden sources of livelihood for fishermen and fishing communities. It is interesting to say that Malaysia tends to focus on human capital development, especially among the fishermen community who are among the groups facing high poverty rate. In general cases, the government assistances are provided directly to fisherman in different ways such as loans, loan guarantees, grants, tax exemptions or tax preferences, equity infusions, income support, price or market controlling programs, etc (Schrank, 2000; Clark, et al., 2005; Khan, et al., 2006; Ali, et al., 2017).

A great deal of evidence shows that fishermen and fishing communities in developing countries are greatly struggling with high and growing levels of poverty (Béné, 2004; Olale, Henson & Cranfield, 2013; Solaymani & Kari, 2014; Alemu & Azadi, 2018). Malaysia is no exception. The participation of fishermen and fishing communities in Malaysia is largely structured by the poor and low-income groups in small-scale fisheries who depends solely on fish catching for their livelihood. Thus, these small-scale fishing households often faces income instability due to declining catches and monsoon season. Studies suggest that fishermen and fishing communities in Malaysia, who are mainly categorized as economically disadvantaged rural-dwelling population, require government support (Solaymani & Kari, 2014; Ali, et al., 2017; Ghani, et al., 2017). Ali, et al., (2017) urged that the government should not only take on effective fisheries management to enhance fishing pressure in the sea, but also expand

alternative livelihood opportunities for fishermen and fishing communities in Malaysia. Their quality of life would improve significantly with the aid and funds provided by the government (Ghani, et al., 2017). Therefore, the evaluation of the impact of public expenditure in fishing industry should take also the wellbeing of fishing community into consideration, especially from the perspective of increasing their income levels.

The fishing industry is one of the important sectors in Malaysia. It contributes significantly towards the socio-economy and development of Malaysia. Among others, it provides employment opportunities, increase the per capita income of the population and improve the quality of life of the population/fishermen by reducing unemployment and poverty rates in rural areas. Moreover, the level of fish production is still not sustainable despite the fact that diverse range of fisheries subsidies have been provided in Malaysia for many years. For example, in 2017, RM192.5 million out of RM2,219 millions of government fund in agriculture and rural development was directed to fishing activities. This conveys a need for an extensive re-evaluation of the appropriateness of public resources to the fishing industry to minimize cost of operation effectively. Subsidies that would add value to the fish products should be given priority (Ali et al., 2017). The efficiency of the industrial operation would lead to a growth in the fishing activities covering capture fisheries and aquaculture, which in turn, boosting fish supplies domestically.

At the same time, there is some room for improvement in current Malaysian fisheries studies where there is still lack of understanding to reveal the flow-on effects to production sectors, institutions and the government. Therefore, this review study aims to deal the wellbeing of fishing community in Malaysia in terms of public expenditure in the fishing sector. The study will help the policy makers to develop strategy to ensure the well-being of fishing community since majority of the poor and low-income segments deal in fishing and agricultural activities.

### **Public Expenditures in the Malaysian Fishing Industry**

In the modern era, public expenditure means the provision of collective wants in order to optimise society's consumption in a rational way and to maximise social and economic welfare. This is also the case of government expenditures towards the fishing sector, and all the other sector of economies in Malaysia.

The reasons for government-expenditure in the fisheries sector include the following.

- To ensure economic welfare of the citizens: Government carries out expenditures in order to promote and increase the economic welfare of its people. This goes a long way to improve the standard of living of its people.
- To ensure security of goods and property: The life and property of its people are protected through the provision of social services such as defence, law and order, fire brigade etc.
- Provision of public and merit goods and services: Goods and services are very expensive to produce by the private sector. It is therefore the government's responsibility to provide these goods and services in order to bridge the gap between the rich and the poor.
- To reduce unemployment: The government carries out expenditure on some economic activities in order to increase the rate of employment.
- To ensure reduction in crime: Government's expenditure is also aimed at reducing the level of crime wave in the economy. This encourages social stability and economic growth and development.

As a result of government spending, the capacity to labour and save experiences an upward trend. Government investment introduces a variety of social and economic amenities that enhance the capabilities of the labour force. This increased capacity results in increased productivity and employment opportunities.

Fisheries Development Authority of Malaysia (LKIM) is the main conduit for public funding to reach fishery communities. Currently, government aid channelled through LKIM focuses on enhancing fishermen's capacity and efficiency. This initiative includes skill-building and educational programmes designed for the adolescents and children of fishermen.

In addition, LKIM has implemented the Fishermen's Fund Loan Scheme, which aims to promote fishermen's independence. The programme aims to improve the capabilities of extant vessels through modernization and technological advancements, and it also encourages the purchase of new vessels and equipment.

In addition, the government provides fishermen's associations with operational capital financing and fish marketing revolving capital. Included in these loan programmes are the Fishermen's Institution Development Loan Scheme (SPIN), the Commercial Fishermen Loan Scheme (SNEK), the Deep Engine Fisherman Loan Scheme (SNED), and the Coastal/Sea Fishermen Loan Scheme (SNEP).

LKIM has implemented the Diesel and Fishermen's Petrol Subsidy Scheme in light of the rising cost of living and fishing operations. This initiative helps fishermen mitigate the rising costs associated with fishing operations as a result of soaring oil prices. Notably, a total of 53,012 e-diesel and e-petrol applications were approved to facilitate fishermen to obtain subsidized diesel and petrol supplies at 146 diesel outlets and 242 subsidized petrol outlets nationwide. Subsidy on fuels such as RON95, RON97 and Diesel is very important, without subsidy led to the increase in fuel prices by 32% on average, and then led to an increase in production input costs particularly in fishing sector (Harun et al., 2018; Ying & Harun, 2019). Sulaiman, Harun and Yusuff (2022) stated that removing fuel subsidies would hit economic performance through high input costs, specifically for industries closely attached to the petroleum refinery sector.

LKIM's continuous annual disbursement of RM142 million in fish catch incentives (IHTI) demonstrates its commitment to supporting fishermen. These incentives provide incentives to fishing vessel owners based on declared fish landings, thereby encouraging the landing of domestic fishery products. Through catch declarations, these measures also ensure that the subsidised fuel acquired by vessel proprietors is used exclusively for fishing purposes.

Moreover, LKIM continues to provide fishermen with RM250 per month in subsistence allowances (ESHN) to alleviate the economic duress caused by rising living costs. Additionally, this endeavour ensures the viability of the fishing industry sector. Alone in 2019, RM81,037,000 was distributed to 34,000 fishermen across the country.

In accordance with LKIM's responsibility to protect the welfare of fishermen, the Fishermen's Special Housing Project (PKPN) has been initiated. This project seeks to improve the living conditions of low-income fishermen through construction, repair, and resettlement initiatives. Since 2012, a substantial allocation of RM459.9 million has been channelled directly to LKIM to support this ongoing effort.

The 2012 implementation of a fishermen's insurance scheme continues to serve its intended purpose of providing financial protection for fishermen's families in the event of catastrophes or unforeseen events. This insurance programme provides up to RM155,000 in benefits and protection to participating fishermen.

LKIM provides relief funds for natural disasters, thereby bolstering support mechanisms. These funds provide immediate financial assistance to mariners affected by accidents, property damage, or even death, easing the burdens of victims and their families. Additionally, economic development assistance and industrial support are provided to fishermen's associations engaged in diverse production projects, including fish capturing, aquaculture, fish marketing, processing, and agrotourism.

Lastly, LKIM's central role is highlighted by its facilitation of modern and extensive landing complex facilities across the nation. This commitment considerably strengthens the nation's fishing industry by enhancing the capacity and efficiency of daily fishing operations through the provision of essential infrastructure.

## **Public Expenditures and Fishing Community Wellbeing in Malaysia**

The topic of quality of life and wellbeing has been thoroughly examined by researchers and thinkers. Multiple definitions and viewpoints of wellbeing have been derived from several academic disciplines, including anthropology, economics, psychology, sociology, and other social sciences. Smith and Clay (2010) emphasise the multifaceted nature of wellbeing, frequently examined within the framework of family wellbeing, which is intricately linked to financial resources and their distribution in order to achieve desired goals (Laily & Lokman, 2005). According to Renwick (2006), the concept of wellbeing incorporates various aspects such as experiences of enjoyment, contentment, and a sense of meaningfulness in life.

In her study, Norizan (2003) thoroughly examines the various aspects of wellbeing, classifying them into two distinct dimensions: objective and subjective attributes. Objective wellbeing refers to several external elements that contribute to an individual's overall wellbeing, including money, housing, health, and education. On the other hand, subjective wellbeing pertains to an individual's internal feelings of satisfaction and contentment, which are derived from accomplishments such as successful careers, thriving children, and peaceful households. The aforementioned duality presents the concept of wellbeing as a combination of both objective and subjective components, hence emphasising its intricate and multifaceted character.

Essentially, wellbeing denotes a condition characterised by the presence of good affect, contentment, and a perception of personal meaning and importance. According to Mohd Fadhil (2003), the concept of wellbeing encompasses efforts aimed at addressing various difficulties and improving the quality of human life through the promotion of secure, healthy, and comfortable living situations across multiple dimensions, including physical, social, and psychological aspects. Siti Fatimah (2006) asserts that the concept of wellness surpasses just financial things, incorporating intangible aspects such as love, warmth, compassion, and open-mindedness within interpersonal relationships.

The assessment of wellbeing frequently encompasses a range of characteristics, including but not limited to income, property ownership, expenditures, poverty thresholds, consumer price indices, socioeconomic status, employment, and education (Laily & Lokman, 2005). Furthermore, the assessment of wellbeing can be conducted by considering factors such as health, housing, and family dynamics (Laily et al., 1999). Scholars have utilised a combination of objective and subjective assessments to evaluate the state of wellbeing (Laily et al., 1999; Smith & Clay, 2010, Harun & Loo, 2023). In their study, Laily et al. (1999) employed a subjective methodology to assess the welfare of individuals residing in Kuching, Johor Bharu, and Kuala Lumpur.

In the Malaysian context, it is noteworthy that the coastal population of Terengganu possesses a historical association with the practise of fishing. The community encounters various obstacles, including diminished catches and meagre wages, primarily attributable to its reliance on the natural environment. The lack of enough financial resources, technological advancements, and comprehensive understanding of the market further impedes their potential for economic success. As a result, the government has implemented several programmes aimed at improving the welfare of fishermen. These programmes include subsidies, support for needed infrastructure, advice services, training programmes, seminars, and promotional activities. In order to mitigate the everyday expenses incurred by registered fisherman, a range of subsidies has been provided, including support for oil, fish prices, food-grade fish boxes, boat assistance, and lodging.

The study conducted by Clark et al. (2005) highlights that fisheries subsidy, which are frequently provided on a significant scale, have the potential to successfully stimulate fishing operations and enhance the welfare of fishing communities. Duc (2008) identified comparable patterns in Vietnam, indicating a positive correlation between government assistance and heightened levels of pleasure and income among fish farmers. In their study, Muda et al. (2009) examined the factors that influence the welfare of coastal fisherman in Kuala Terengganu. The researchers emphasised the interconnectedness of fishermen's characteristics, government policies, and community dynamics in shaping their overall wellbeing. Nevertheless, the role of the community has emerged as a crucial determinant of the wellbeing of fishing communities.

The importance of environmental restrictions and adaptive techniques on the quality of life among fishing households has been emphasised in another research, such as the one conducted by Noviati et al. (2011). The fishing community's wellbeing is significantly influenced by limits that are derived from both the physical and social surroundings. Ramli et al. (2015) conducted a study that expanded upon the aforementioned investigation by exploring the reported inequalities in wellbeing between offshore and deep-sea fishermen in Sedili, Johor. Although there may be similarities in profession, the perceptions of individuals on wellbeing vary. Nevertheless, the provision of financial assistance directly from governing bodies had a favourable impact on the reported well-being of fishermen.

In their study, Muda et al. (2006) undertook a thorough examination of the various elements that exert an influence on the overall wellbeing of coastal fishermen in Kuala Trengganu. The study primarily concentrated on four essential factors in order to comprehend the socioeconomic issues encountered by the fisherman. These categories encompassed the features of the fishermen, government action, community involvement, and demographic variables. Numerous determinants, encompassing characteristics like as income, savings, house ownership, health, education, and the role of government, have been identified as significant influences on overall wellbeing.

The study conducted by Carnegie and Raja (2018) examined the allocation of government funds in the marine and fisheries industry, specifically focusing on the distribution of fishing vessels to fishermen in Sabang, Indonesia. The findings of their research demonstrated that the provision of such support resulted in an increase in the earnings of recipients, highlighting the significance of precise allocation strategies and the possibility of integrating non-technical skill development with monetary help.

Government support in the form of fuel subsidies has a direct and significant influence on the financial stability of the fishing community. The authors, Lee and Viswanathan (2019) emphasised the importance of fuel subsidies for small-scale fishers in the states of Perlis, Kedah, and Perak. The provision of subsidies was shown to be essential in ensuring sustainable income, particularly for those operating in Zone A, where operational costs can exceed generated revenue. In a similar vein, Ali et al. (2017) demonstrated the reliance of fishermen on subsidies, highlighting the significant role of fuel subsidies in facilitating the expansion of fishing capabilities.

In their study, Husain, Ali, and Arzemi (2020) conducted a regression analysis to examine the effects of fuel subsidies on the income of small-scale fisherman in the regions of Kedah and Perlis. The researchers investigated many aspects, including fishing methods, government aid, and demographic features, in order to establish correlations with the fishermen's income levels. Fuel subsidies have become a crucial source of support for fishermen in Zone A, leading to a notable decrease in operational expenses and enabling the maintenance of a sustainable income. The subsidies had the greatest impact on the fishermen of Kuala Sungai Baru in Zone B. From the results, the fishermen in Zone A are very depending on fuel subsidies in term of reducing the cost of fishing operation with the fishermen of Kuala Perlis are most benefiting the fuel subsidies by RM670 per month followed by fishermen of Tanjung Dawai (RM640), Kuala Muda (RM602), Kuala Kedah (RM574), and Kuala Sungai Baru (RM567.50). For the Zone B, the fishermen of Kuala Sungai Baru are benefiting the fuel subsidies by RM1572 per month, followed by fishermen Kuala Muda (RM1429), Tanjung Dawai (RM1148.22), Kuala Perlis (RM1,025), and Kuala Kedah (RM977).

Abdul Ghanie, Awang Marikan, and Abu Bakar (2020) conducted a study to examine the level of willingness to accept (WTA) among Sarawak fisherman in relation to the adoption of sustainable Terubok fisheries. The contingent valuation method yielded valuable information regarding the level of compensation that would be necessary to incentivize fishermen to adopt sustainable practises. Based on the results found that RM301.08 is the mean amount of WTA for 200 fishermen. That means, the government need to pay the compensation around RM60, 216 for 200 fishermen with RM822.29 is the largest amount that been paid for one fisherman that willing to accept WTA. This study emphasises the importance of financial factors in the promotion and maintenance of sustainable fishing practises.

The utilisation of Information and Communications Technology (ICT) holds the capacity to bring about a transformative impact on the fishing sector. In their study, Omar et al. (2011) investigated the importance of information and communication technology (ICT) technologies, including GPS, sonar, wireless devices, computers, the internet, and mobile phones. These technologies provide enhanced

capabilities for monitoring fishing areas, meteorological conditions, and communication, hence enhancing socio-economic status and promoting safety consciousness among fishermen.

Muktar, Man, Kamaruzzaman, Abu Samah, and Umar (2018) conducted an analysis on the impact of Information and Communication Technology (ICT) in enhancing the resilience and sustainability of the livelihoods of fishermen residing in the East Coast region of Malaysia. The utilisation of these technologies has played a crucial role in facilitating the spread of information related to weather conditions, risks, advisory services, and socio-economic networking. As a result, the resilience of the fishing community has been significantly enhanced.

In their study conducted in Pulau Payar, Kedah, Ramli, Abdullah, and Ashok (2016) examined the effectiveness of concrete artificial reefs. The methods been used for this study are Margalef's index, Menhinick's index to observe the species richness and Shanon-Weiner and Simpson for biodiversity measures. Based on the findings, only 13.7% of maximum richness of the natural reefs been recorded of Margalef's index and Menhinick's index report. However, the report of the Shannon-Weiner index and Simpson index showing a positive result with 87.8% and 88% of biodiversity reports respectively.

The implementation of robust rules and strategic approaches plays a crucial role in ensuring the long-term viability of fish stocks, the preservation of the marine ecology, and the livelihoods of fishermen. In their study, Wong and Yong (2020) examined the application of fishing rules and tactics in the Straits of Malacca, emphasising the significance of measures such as Maximum Sustainable Yield (MSY) and mesh size regulation in promoting the sustainability of coastal fisheries.

In their study, Ghani et al. (2017) conducted an investigation into the assessment of the fishermen's quality of life in the West Coast of Peninsular Malaysia, focusing specifically on the influence of government funds. A total of 22 individuals engaged in full-time fishing activities, together with 2 representatives from the Lembaga Kemajuan Ikan Malaysia (LKIM), were subjected to face-to-face interviews and focus group discussions. The purpose of these interactions was to examine the efficacy of government aid programmes in the states of Selangor, Perak, Kedah, and Johor. Based on the research findings, it is evident that fishermen heavily rely on fuel subsidies, particularly following the implementation of the floating system for fuel prices by the government. Moreover, there is evidence of misallocation of these funds towards non-essential purchases. Notably, Malay fishermen exhibit a greater dependence on government assistance compared to their Chinese counterparts. Consequently, there is a collective desire among fishermen for the government to address the restoration and reconstruction of sea barriers and artificial reefs.

In their study, Bowlekar, Gawali, and Tilekar (2019) conducted an analysis to evaluate the efficacy of a small-scale sea water treatment plant. A variety of materials, including sand, gravel, grit, charcoal, broken brick, gypsum, sponge, and sawdust, have been employed to assess the efficacy of the approach for filtering seawater. Based on the results, it can be observed that the electrical conductivity (EC) and pH levels of the untreated sea water have decreased from 51.9dS/m to 44.9dS/m and from 8.29 to 7.60, respectively. Subsequently, the efficacy of the approach was determined at distances of 45 cm, 30 cm, 15 cm, 7.5 cm, 15 cm, and 30 cm, correspondingly.

Furthermore, Alam et al. (2011) conducted a study that examines the effectiveness of governmental and external agency support in aiding the adaptation of Malaysian rice farmers to the rapidly changing climatic conditions. Based on the findings of the survey, it is evident that a significant proportion of farmers maintain the perspective that acquiring additional fertiliser is not a necessary requirement for their present degree of adaptation. Nevertheless, a significant segment of farmers express discontentment with the present extent of governmental support in mitigating the difficulties presented by climate change. This study emphasises the significance of external support networks in enhancing the long-term sustainability of agriculture and the lives of farmers. In order to enhance farmers' ability to effectively address the challenges presented by climate change, it is imperative to adopt a complete strategy that goes beyond the exclusive dependence on incentives and subsidies. This approach should prioritise the importance of training and motivational measures, which may significantly bolster farmers' capacity in this regard. In conclusion, the study emphasises the importance of robust support systems in enabling farmers to efficiently address the impacts of climate change. The findings of this study are consistent with previous research conducted on the impact of climate change on farmers



wellbeing and fish security, as indicated by a number of related studies (Alam et al., 2011; Alam et al., 2018).

### **Status of Malaysian Fishermen Communities**

The issue of food security, which is marked by an inconsistent and unsustainable food supply, has a significant influence on the livelihoods of fishing communities in Malaysia. The vulnerability experienced as a result of scarcity frequently leads to a situation where these households become trapped in a persistent cycle of poverty. The consequences have a broader impact on their food spending habits, hence intensifying the vulnerability of their food security situation. The aforementioned detrimental pattern significantly impacts individuals engaged in fishing activities, whose main source of revenue heavily relies on the sale of fish-based commodities. The inability to obtain necessary resources for sustaining a livelihood exacerbates the problem, resulting in these populations being in a condition of vulnerability that hinders the achievement of genuine food security. The lack of these resources inherently reduces sources of income, hence affecting expenditures on food. According to Schoch and Campaign (2010), poverty plays a dual role by acting as a stimulus for food shortage and serving as a clear indicator of nutritional hazard.

It is worth noting that populations reliant on fishing are highly vulnerable to several threats, including economic downturns, monsoons, and tsunamis. The susceptibility shown in this group is a result of their low-income upbringing, which further amplifies their risk, especially among the hardcore poor sector. The combination of these external factors amplifies the difficulties in attaining food security for fishermen who depend on fishing as their main source of income.

The study conducted by Muda and Amin (2009) sheds light on the living conditions of coastal fishermen in Kuala Terengganu, revealing a distressing state of significant deprivation. Addressing the wellbeing difficulties encountered by these fishermen requires a collaborative endeavour including two primary stakeholders: the fishermen themselves and the government. When examining the various aspects of fishermen's traits and the role of the government, numerous key factors come to the forefront. The factors encompassed in this category consist of income, educational attainment, ownership of vehicles, residential properties, savings, expenditures, and land designated for residential use. Concurrently, the government assumes the obligation for several aspects like the provision of educational courses and training, offering consulting services, facilitating marketing initiatives, conducting research and development activities, and developing infrastructure.

The fundamental relationship between these traits and the role of the government is evident. Therefore, this study presents a complete framework outlining the necessary steps for government initiatives aimed at enhancing the welfare of fishing communities. This involves the implementation of strategies to improve courses and training programmes, together with the dissemination of specific announcements and ongoing evaluation to assess their efficacy. There is a need to enhance advisory and consultative services, wherein officers actively engage in direct interactions to deliver timely recommendations. Implementing strategies to optimise the marketing system, minimise the involvement of intermediaries, and enhance research and development efforts are crucial supplementary actions. It is recommended that there be enhancements and expansions in infrastructural quality, contingent upon the fishermen's commitment to self-improvement.

In a study conducted by Ramli and Rabani (2017) that explored the wellbeing of fisherman, it was found that despite expressing modest levels of satisfaction with government subsidies, the fishermen in Terengganu demonstrated a notably high degree of wellbeing. The issues they face are a result of the increasing costs of energy and the occurrence of the monsoon season. There exists a consensus among individuals on the need for augmented governmental aid and subsidies, which is indicative of their dependence on such help to alleviate their hardships. Significantly, this emphasises the imperative need for ongoing subsidies that beyond political connections.

In his study, Hatcher (2000) explores the impact of public monies on improving the welfare of fishermen. He emphasises the effectiveness of direct subsidies, which encompass a range of support mechanisms such as funding for fishing vessels and vessel enhancements. These funds clearly enhance the quality of life for fisherman. In a similar vein, the research conducted by Nguyen Minch Duc (2007)

examined the levels of satisfaction among farmers on their engagement in aquaculture activities. The study shed light on the intricate interplay between satisfaction, the improvement of livelihoods, and the sustainability of food supplies.

In a nutshell the tenuous situation of fishing villages in Malaysia highlights the complex array of obstacles they face in attaining both food security and general welfare. The complex interplay between poverty, vulnerability, and state assistance intricately shapes individuals' lived experiences. The intricate interaction of these factors necessitates continuous and focused endeavours, undertaken by both governmental entities and the fishermen themselves, to cultivate increased livelihoods and bolstered food security within these crucial communities.

### **Results and Discussion**

The results of this study highlight a clear correlation between government intervention and the increased contentment experienced by individuals engaged in fish farming. It is worth noting that there is a positive correlation between the level of contentment and the extent of governmental aid provided to farmers. This correlation is further associated with higher income levels, which in turn contribute to an enhanced state of general welfare among farmers. This is consistent with previous studies that highlight the importance of increasing income and diversifying economic activities as crucial elements for improving the socio-economic conditions of fishing communities. The comprehensive support, primarily provided by the government, plays a crucial role in driving communal advancement.

According to Ramli et al. (2015), it is appropriate to argue that the perception of wellbeing among fishermen does not always exclude the presence of obstacles in their lives. The ability of fishermen to adjust to changing circumstances requires them to find satisfaction with their present condition, while also recognising the importance of maintaining financial stability. Given the significant dependence of fishing on uncertain weather patterns, it becomes crucial to have a diversified income stream through secondary work. It is crucial to concurrently address the educational shortfall within the fishing community. The lack of access to education presents a barrier to admission into alternative industries that have the potential to enhance individuals' livelihoods. By campaigning for improved educational possibilities for their children, fishermen have the potential to ensure a more promising future for their families, thereby disrupting the cycle of restricted prospects.

The role of government intervention is seen as a pivotal trigger in this narrative. The various components encompassing government involvement, infrastructure development, training initiatives, consulting services, marketing strategies, enforcement measures, and research and development efforts play a crucial part in enhancing the overall life happiness of fisherman. Salahudin et al. (2011) provide support for this assertion, as they attribute the elevated levels of satisfaction observed among fisherman to the active involvement of the government. The provision of ongoing financial and physical support, implemented with a high degree of transparency, has the potential to significantly enhance their overall standard of living.

The recommendations presented are in accordance with the trajectory of the research. The continuity of the fishermen's assistance programme is recommended, albeit with the implementation of transparent delivery systems. The enhancement of support through the provision of advisory services contributes to the cultivation of self-reliance and positivism, hence amplifying its overall impact. The effectiveness and relevance of courses and training can be enhanced by measures aimed at strengthening them. Additionally, improving marketing facilities through infrastructural enhancements can increase access to markets. The correlation between the implementation of fibre boat assistance and the enforcement of fishing licence prerequisites exhibits potential as a regulatory instrument.

The fishing business holds immense importance as a key source of protein for the nation, within a larger framework. The value of this entity extends beyond its nutritional aspects, as it is intricately linked to both economic development and the overall welfare of the community. The matter of fish marketing holds significant importance, necessitating regulatory measures to maintain fair pricing and a consistent supply. The implementation of rules pertaining to the marketing chain of fish shows potential in mitigating the impact of intermediaries. Through a strategic emphasis on ensuring sufficient supply stock, institutions such as LKIM possess the ability to exercise influence over both the dynamics of the market and the prevailing prices.

In conclusion, this study highlights the significant influence that well-managed and productive public expenditures have on the self-reliance of the fishing industry and the general welfare of fishery communities. The comprehensive well-being of these essential communities is achieved by the interdependent connection between governmental assistance, varied sources of income, educational opportunities, and improvements in infrastructure. Given the complex issues confronting the fishing industry, it is imperative to implement well-considered policy interventions in order to secure a sustainable future for both the availability of fish and the well-being of people who rely on it.

### **Conclusion**

This in-depth analysis explores the intricate web of relationships between public expenditures, food security, sustainable fish availability, and the overall welfare of Malaysian fishing communities. As global concerns over population growth and climate change intensify, it becomes crucial to comprehend their interrelationships. Through an in-depth analysis of existing literature, policy evaluations, and data synthesis, this study highlights the significant impact of public financial allocations on food security and the long-term viability of fish resources, thereby influencing the prosperity of Malaysian fishing communities.

The findings of this analysis shed light on the far-reaching effects of effective public expenditures in addressing food security issues. As public interventions strengthen food security and assure sustainable fish availability, fishing communities experience tangible improvements in physical health, decreased susceptibility to hunger, and increased economic stability. This positive trend not only contributes to social cohesion and provides the groundwork for long-term development, but also directly benefits the well-being of community members. The results of the study demonstrate a distinct correlation between government intervention and the increased welfare of fish farmers. This connection highlights the positive relationship between government assistance and individual well-being, which is further supported by higher income levels. This correlation is consistent with previous research highlighting the crucial role of income growth and economic diversification in improving the socioeconomic conditions of fishing communities. The government's all-encompassing assistance emerges as a crucial factor in these communities' overall advancement.

This research contributes to the existing corpus of knowledge by establishing a coherent framework that links public expenditures, food security, and the welfare of fishing communities. These theoretical foundations illuminate the dynamic interplay between economic policies, resource sustainability, and societal well-being. On a practical level, the study highlights the significance of well-targeted public expenditures in attaining comprehensive development in fishing communities. These insights can be utilised by policymakers and stakeholders to tailor interventions that not only guarantee food security but also foster sustainable fish availability and community resilience.

Several policy recommendations can be formulated based on the study's findings. Increasing investments in skill training, education, and technological advancements can increase the capacity and efficacy of fishing communities, resulting in higher income levels. Secondly, encouraging sustainable fishing practises with subsidies and financing programmes can contribute to the preservation of marine ecosystems and the long-term availability of resources. Lastly, the continued provision of financial assistance, subsistence allowances, and insurance programmes by the government can alleviate economic pressures and ensure the well-being of fishery communities.

**Limitations of the Study and Future Research Directions** Despite the fact that this review provides valuable insights, it is essential to recognise its limitations. The scope of the study may not encompass all nuances of the discussed intricate interactions. Future research could delve deeper into the cultural, social, and environmental factors that affect the prosperity of fishery communities. In addition, a longitudinal study could shed light on the effects of policy interventions on the sustainable development of these communities over time.

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## References:

- Aborisode, B. & Bach, C. (2014). Assessing the pillar of sustainable food security. *European International Journal of Science and Technology*, 3(4), 117-125.
- Ahmad, M. Z. (2011). International legal and normative framework for responsible fisheries, with reference to Malaysia's offshore EEZ fisheries management. (Doctoral dissertation). <https://ro.uow.edu.au/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=4410&context=theses> (accessed 29 August 2021).
- Alam, L., Mokhtar, M., Alam, M.M., Bari, M. A., Nicholas, K., Ta, G.C., & Khai, E.L. (2015). Assessment of Environmental and Human Health Risk for Contamination of Heavy Metal in Tilapia Fish Collected from Langat Basin, Malaysia. *Asian Journal of Water, Environment and Pollution*, 12(2), 21-30.
- Alam, M.M., Mohd Ekhwan, T., Siwar, C., Molla, R.I., & Talib, B. (2011). The Impacts of Agricultural Supports for Climate Change Adaptation: Farm Level Assessment Study on Paddy Farmers. *American Journal of Environmental Sciences*, 7(2), 178-182. <https://doi.org/10.3844/ajessp.2011.178.182>
- Alam, M.M., Siwar, C., & Wahid, A.N.M. (2018). Resilience, Adaptation and Expected Support for Food Security among the Malaysian East Coast Poor Households. *Management of Environmental Quality*, 29(5), 877-902. <https://doi.org/10.1108/MEQ-01-2018-0013>
- Alemu, A.E., & Azadi, H. (2018). Fish value chain and its impact on rural households' income: Lessons learned from Northern Ethiopia. *Sustainability*, 10(10), <https://doi.org/10.3390/su10103759>
- Ali, J., Abdullah, H., Noor, M.S.Z., Viswanathan, K.K., & Islam, G.N. (2017). The contribution of subsidies on the welfare of fishing communities in Malaysia. *International Journal of Economics and Financial Issues*, 7(2), 641-648.
- Baker, A. C., Glynn, P. W., & Riegl, B. (2008). Climate change and coral reef bleaching: An ecological assessment of long-term impacts, recovery trends and future outlook. *Estuarine, coastal and shelf science*, 80(4), 435-471.
- Béné, C. & Heck, S. (2005). Fisheries and the Millennium Development Goals: Solution for Africa. *NAGA WorldFish Center Quarterly*, 28(3), 4-13.
- Béné, C. (2004). Poverty in small scale fisheries: A review and some further thoughts. In: Neiland, A.E., Béné, C. (eds) *Poverty and Small-scale Fisheries in West Africa*. Springer, Dordrecht. [https://doi.org/10.1007/978-94-017-2736-5\\_5](https://doi.org/10.1007/978-94-017-2736-5_5)
- Carnegie, D. T. & Raja, M. (2018). The impact of sub-national government spending in marine and fisheries sector towards fishermen's income: a case study of Sabang, Indonesia. *Russian Journal of Agricultural and Socio-Economic Sciences*, 79(7), 369-377. DOI <https://doi.org/10.18551/rjoas.2018-07.43>
- Chariton, K. (2016). Food security, food systems and food sovereignty in the 21st century: A new paradigm required to meet Sustainable Development Goals. *Nutrition and Dietetics*, 73(1), 3-12. <https://doi.org/10.1111/1747-0080.12264>
- Cinner, J. E., Graham, N. A., Huchery, C., & MacNeil, M. A. (2013). Global effects of local human population density and distance to markets on the condition of coral reef fisheries. *Conservation Biology*, 27(3), 453-458.
- Clark, C. W., Munro, G. R. & Sumaila, U. R., (2005). Subsidies, buybacks, and sustainable fisheries. *Journal of Environmental Economics and Management*, 50(1), 47-58.
- Danylchuk, A. J., Griffin, L. P., Ahrens, R., Allen, M. S., Boucek, R. E., Brownscombe, J. W., ... & Cooke, S. J. (2023). Cascading effects of climate change on recreational marine flats fishes and fisheries. *Environmental Biology of Fishes*, 106(2), 381-416.
- FAO. (2005). Increasing the contribution of small-scale fisheries to poverty alleviation and food security (FAO Technical Guidelines for Responsible Fisheries No. 10). Rome, Italy: FAO.
- FAO. (2008). An introduction to the basic concepts of food security. Retrieved from <http://www.fao.org/3/al936e/al936e00.pdf>
- Ghani, N.A., Raub, M.A., Adam, F., Abdullah, B., & Afgani, Y. (2017). Fishermen's dependence on government funds and it's impact on their quality of life (QOL) in the West Coast of Peninsular Malaysia. *Man In India*, 97(22), 341-351.
- Godrich, S.L., Payet, J., Brealey, D., Edmunds, M., Stoneham, M., & Devine, A. (2019). Southwest food community: A place-based pilot study to understand the food security system. *Nutrients*, 11(4), 738. <https://doi.org/10.3390/nu11040738>
- Harun, M., Che Mat, S.H., Fadzim, W.R., Mohd Khan, S.J., & Noor, M.S.Z. (2018). The effects of subsidy removal on input costs of productions: Leontif input-output price model, *International Journal of Supply Chain Management*, 7(5), 529-534, Excelling Tech.
- Harun, M. & Loo, S.Z. (2023). *Public Expenditure and Income Distribution in Malaysia*, Routledge, Taylor and Francis, United Kingdom.
- Hatcher. A. (2000). Subsidies for European fishing fleets. *The European Community's Structural Policy For Fisheries Marine Policy*, 24, 129-140.

- Khan, A., Sumaila, U.R., Watson, R., Munro, G., Pauly, D. (2006). The nature and magnitude of global non-fuel fisheries subsidies. In: Sumaila, U.R., Pauly, D. (Eds.), *Catching more bait: A bottom up re-Estimation of global fisheries subsidies* (Fisheries Centre Research Reports, 14(6)). Vancouver, Canada: Fisheries Centre, University of British Columbia.
- Laily, P., & Lokman, I. (2005). Perbelanjaan pengangkutan dan komunikasi di kalangan pengguna di Batu Pahat, Johor. *Malaysian Journal of Consumer and Family Economics*, 8, 101-113.
- Laily, P., Ahmad H. H., Nurizan, Y. (1999.) Kesejahteraan hidup di kalangan isi rumah perumahan kos rendah di bandar metropolitan. *Malaysian Journal of Consumer and Family Economics*, 2, 23-36.
- Mcclanahan, T.r., Allison, E.A., & Cinner, J. (2013). Managing fisheries for human and food security. *Fish and Fisheries*, 16(1), 78-103. <https://doi.org/10.1111/faf.12045>
- Mellor, J.W. & Johnston, B.F. (1984). The world food equation: Interrelations among development, employment, and food consumption. *Journal of Economic Literature*, 22(2), 531-574.
- Mohd Fadhil, N. (2003). Penilaian dampak pembangunan ke arah kesejahteraan masyarakat: Penilaian dampak sosial. Utusan Publication dan Distributor, Kuala Lumpur.
- Muda, M. S., Amin, W. A. A. W. M, Hasan, F. A., Mohamed, S., Mat, N. H. N., Omar, I., Abas, M. M., Akhir, N. H. M. & Nor, S. M. (2011). Penentu kepuasan nelayan terhadap program bantuan kerajaan di Terengganu. *Jurnal Pembangunan Sosial*, 14 (Jun), 67-87.
- Muda, M. S., Wan Mohd Amin, W. A. A., & Omar, N. W. (2006). Analisis Kesejahteraan Hidup Nelayan Pesisir. *Jurnal Kemanusiaan*, 4(2). Retrieved from <https://jurnalkemanusiaan.utm.my/index.php/kemanusiaan/article/view/162>
- Munro, G., Sumaila, U.R. (2002). The impact of subsidies upon fisheries management and sustainability: The case of the North Atlantic. *Fish and Fisheries*, 3, 233-250.
- Norizan A.G. (2003). Kualiti hidup penduduk pulau negeri Terengganu: Satu kajian di Pulau Redang dan Pulau Perhentian. Unpublished PhD Thesis. Kolej Universiti Sains dan Teknologi Malaysia (KUSTEM). Terengganu.
- OECD, (2003). *Environmentally Harmful Subsidies: Policy Issues and Challenges*. Paris: Organisation for Economic Cooperation and Development.
- Olale, E., Henson, S., & Cranfield, J. (2013). Determinants of income diversification among fishing community in Western Kenya. *Food Policy*, 125-126, 235-242. <https://doi.org/10.1016/j.fishres.2012.02.029>
- Ottersen, G., Hjermand, D. Ø., & Stenseth, N. C. (2006). Changes in spawning stock structure strengthen the link between climate and recruitment in a heavily fished cod (*Gadus morhua*) stock. *Fisheries oceanography*, 15(3), 230-243.
- Panghal, A., Mor, R. S., Kamble, S. S., Khan, S. A. R., Kumar, D., & Soni, G. (2022). Global food security post COVID-19: Dearth or dwell in the developing world?. *Agronomy journal*, 114(1), 878-884.
- Population Pyramid. (2020). Population pyramids of the World from 1950 to 2100: Malaysia, Available at <https://www.populationpyramid.net/malaysia/2050/>
- Ramli, Z. & Rabani, N. A.M. (2017). Kepuasan Terhadap Subsidi dan Kesejahteraan Hidup Komuniti Nelayan, *GEOGRAFI (Special Issue)*, 5(3), 41-45.
- Ramli, Z., Saad, S., Manaf, A. AA., Hussain, M. H., Samsudin, M., Omar, M., & Yussof, I. (2015). Kesejahteraan subjektif: Kajian kes nelayan di Sedili, Kota Tinggi, Johor. *GEOGRAFIA, Malaysia Journal of Society and Space*, 11(2), 87 – 94.
- Renwick, R., (2006), The quality life model, Renwick, R., (2006), The quality life model, <http://www.utoronto.ca/qol/concepts.htm>
- Ricardo, D. (2023). Malaysian Fisheries on the Global Stage: Competitiveness in ASEAN Fish Trade. *Interdisciplinary Research Journal of Management and Social Sciences (IRJMSS)*, 10(3), 11-26.
- Schoch & Campaign. (2010). Food availability in the poorest households. Report of a Survey in central Jharkhand. <http://www.genecampaign.org/Sub%20pages/Food-Availability-in-the-Poorest-Households.pdf>
- Schrank, W.E. (2000). Subsidies for Fisheries: A Review of Concepts. In: Papers Presented to the Expert Consultation on Economic Incentives and Responsible Fisheries: Rome. p28 November - 1 December 2000, 11-39. Rome: FAO Fisheries Report No. 638, Supplement.
- Shaffril, H. A. M., Samah, A. A., & D'Silva, J. L. (2017). Adapting towards climate change impacts: Strategies for small-scale fishermen in Malaysia. *Marine Policy*, 81, 196-201.
- Sharma, S. K. (2023). Impact of Global Warming on Changing Pattern of Biodiversity and Fish Production in Inland Open Waters. In *Outlook of Climate Change and Fish Nutrition* (pp. 49-61). Singapore: Springer Nature Singapore.
- Siti Fatimah Abdul Rahman, (2006). Kriteria kualiti hidup berkeluarga, <http://www.ikim.gov.my/bm/paparmedia.php?key=781>
- Smith, C. L., & Clay, P. M. (2010). Measuring subjective and objective well-being: analyses from five marine commercial fisheries. *Human Organization*, 69(2), 158-168.

- Solaymani, S. & Kari, F. (2014). Poverty evaluation in the Malaysian fishery community. *Ocean and Coastal Management*, 95, 165-175. <https://doi.org/10.1016/j.ocecoaman.2014.04.017>
- Sulaiman, N., Harun, M., & Yusuf, A.A. (2022). Impacts of fuel subsidy rationalization on sectoral output and employment in Malaysia. *Asian Development Review*, 39, 1, pp.315-348.
- Suyani, N. K., Singh, M. K., & Brahmchari, R. K. (2023). Climate Change and Coral Reef Ecosystem: Impacts and Management Strategies. In *Outlook of Climate Change and Fish Nutrition* (pp. 63-74). Singapore: Springer Nature Singapore.
- Tang, K. H. D. (2019). Climate change in Malaysia: Trends, contributors, impacts, mitigation and adaptations. *Science of the Total Environment*, 650, 1858-1871.
- Van der Lingen, C. D., Hutchings, L., Lamont, T., & Pitcher, G. C. (2016). Climate change, dinoflagellate blooms and sardine in the southern Benguela Current Large Marine Ecosystem. *Environmental Development*, 17, 230-243.
- World Food Summit (1996). *Rome Declaration on World Food Security*. <http://www.fao.org/docrep/003/w3613e/w3613e00.HTM>
- Ying, L.S., & Harun, M. (2019). Fuel subsidy abolition and performance of the sectors in Malaysia: A computable general equilibrium approach, *Malaysian Journal of Economic Studies*, 56, 2, pp. 303-326.
- Yusuf, M. S., Musibau, H. O., Dirie, K. A., & Shittu, W. O. (2023). Role of trade liberalization, industrialisation and energy use on carbon dioxide emissions in Australia: 1990 to 2018. *Environmental Science and Pollution Research*, 1-16.