

# Developing a Women Empowerment Fisheries Index (WEFI): An Exploratory Research in the Context of Sarawak, Malaysia

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## ABSTRACT

Malaysia's fisheries sector plays a vital economic and social role, yet the contributions of women remain underrepresented in policy and development efforts. Despite women's active involvement across the fisheries value chain—from aquaculture and processing to marketing and community leadership—gender disparities persist. The Women's Empowerment in Fisheries Index (WEFI), adapted from the globally recognized Women's Empowerment in Agriculture Index (WEAI), offers a robust tool to measure empowerment across five key domains: access to resources, decision-making power, control over income, time allocation, and leadership. However, WEFI has not yet been formally applied in the Malaysian context. This study aims to develop and validate a localized WEFI framework tailored to Sarawak, Malaysia's largest state with significant fisheries activity. A quantitative cross-sectional survey will be conducted using structured interviews with women engaged in various fisheries-related roles. The study employs exploratory and confirmatory factor analysis to test the index's structure, ensuring its cultural and sectoral relevance. The findings will offer empirical insights into empowerment gaps and inform gender-sensitive fisheries policies. By contextualizing WEFI within Malaysia's socio-economic landscape, this research contributes to sustainable fisheries governance, gender equity, and broader development goals aligned with SDGs 5 and 14.

**Keywords:** Women's empowerment, fisheries, WEFI, sustainable development goals, Sarawak

## INTRODUCTION

Malaysia has a long coastline with a 9,323km length and a total economic exclusive zone of 198,173 square km (Southeast Asia Fisheries Development Centre, 2022). Thus, Malaysia is blessed with an abundance of fisheries resources. The fisheries sector plays an important role in Malaysia. Fisheries contribute 0.7 percent to Malaysia's Gross Domestic Product (GDP) in the year 2023 (Malaysia Fisheries Department, 2023) with a total production value of RM16.5 billion. Figure 1 and Figure 2 shows the latest statistics on fisheries performance in Malaysia.

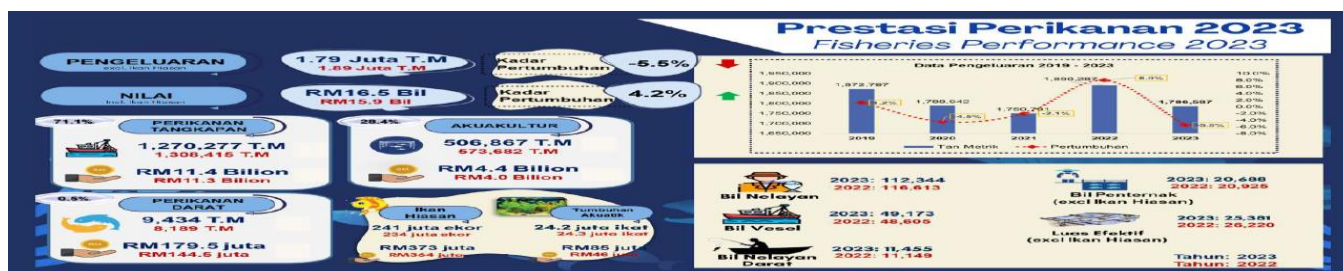


Figure 1 Malaysia Fisheries Performance 2023

Source: Malaysia Fisheries Department, Annual Fisheries Report (2023)

The "Prestasi Perikanan 2023" infographic summarizes Malaysia's fisheries performance. Total production declined by 5.5% to 1.79 million metric tons (T.M) from 1.89 million T.M in 2022. However, the total value increased by 4.2% to RM16.5 billion. Capture fisheries contributed 71.1% of output (1.27 million T.M) worth RM11.4 billion, while aquaculture contributed 28.4% (506,867 T.M) worth RM4.4 billion. Inland fisheries made up only 0.5% of production. Aquaculture details include ornamental fish (241 million), aquatic plants (2.43 billion pieces), and fry (RM373 million value). In 2023, there were 112,344 fishers and 49,173 vessels, both slightly lower than in 2022. Meanwhile, inland fishers increased to 11,455. The number of aquaculture farmers also declined to 20,688. Despite lower production, the rise in value indicates better prices or higher-value products. The five-year trend chart shows fluctuating growth, with 2023 recording the steepest decline since 2021. These reflect both challenges and resilience in the Malaysian fisheries industry in 2023. It underscores the need for sustainable practices, innovation, and investment to stabilize and grow the fisheries sector amid evolving environmental and economic pressures.

Maklumat Am Perikanan, 2019- 2023 Fisheries General Information, 2019-2023					
TAHUN	2019	2020	2021	2022	2023
 Nilai Perdagangan (RM Bilion)	8.6	8.8	9.71	11.58	11.28
 Nilai Eksport (RM Bil)	3.78	3.75	3.88	4.20	4.38
 Nilai Import (RM Bil)	4.85	5.09	5.84	7.38	6.89
 Balance of Trade, BOT (RM Bilion)	-1.07	-1.3	-1.96	-3.18	-2.52
Self Sufficiency Ratio, SSR (%)	92.99	95.27	93.31	90.20	90.7 (p)
Per Capita Consumption, PCC (KG)	45.51	42.70	43.38	46.62	44.7 (p)
Sumbangan Kepada KDNK Pertanian (%)	11.9	11.4	11.4	11.6	11.6
Sumbangan Kepada KDNK Negara (%)	1.0	0.9	0.9	0.8	0.7

(p)=Preliminary

Figure 2 General Fisheries Information (2019-2023)

Source: Malaysia Fisheries Department, Annual Fisheries Report (2023)

Figure 2 presents Malaysia's fisheries data from 2019 to 2023. Trade value rose from RM8.6B to RM11.28B, with exports increasing from RM3.78B to RM4.38B. Imports also rose, resulting in a persistent trade deficit, though slightly improved in 2023 (RM-2.52B). The Self-Sufficiency Ratio (SSR) remained above 90%, indicating strong domestic production. Per capita, fish consumption peaked in 2022 at 46.62 kg but declined to 44.7 kg in 2023. Fisheries consistently contributed 11–11.9% to agricultural GDP and around 0.7–1.0% to national GDP, showing its steady economic importance despite fluctuations in trade balance and consumption trends. These statistics revealed that Malaysia's fisheries sector has a steady but modest role in the broader economy. It also has a continued reliance on imported fishery products despite strong domestic production, and the SSR indicates that Malaysia largely meets its fish demand through local production.

Although gender equality and women's empowerment have been increasingly emphasized recently, there is a lack of standardized and reliable measurement tools to accurately assess and measure the efforts towards reducing the inequalities and progressing towards women's empowerment and marginalized groups (Madaba et al., 2023; Rahma et al. 2025). To derive an index to comprehensively measure the role of women in agriculture and fisheries, the Women's Empowerment in Agriculture Index (WEAI) which is built on Kabeer's definition of empowerment was published in 2012 by the International Food Policy Research and Institute (IFPRI). Empowerment defined by Kabeer, refers to the ability to make strategic life choices to survive and thrive. In the fisheries sector, the WEAI is adopted and being used to assess women's empowerment in the fisheries and aquaculture sector in Bangladesh (Rahma et al. 2025); India, and Zambia (Ragsdale et al., 2022; Cole et al. 2018 and Rahman et al. 2024). Gender inequality is often prevalent in the Asia Pacific region and Africa. The above studies are therefore crucial to addressing the gender equality in fisheries. Women's Empowerment in Fisheries and Aquaculture Index (WEFI) methodology is important and used to measure the empowerment, agency, and inclusion of women in fisheries and aquaculture contexts (McDougall et al., 2022).

However, the WEFI methodology has not been used in the context of women in Malaysia's fisheries sector. This study intends to develop a conceptual framework for integrating the Women Empowerment Fisheries Index (WEFI) in Malaysia's fisheries context. This study adapts the WEFI index in the local context of Malaysia by looking at the case study of Sarawak. Sarawak is the largest state of Malaysia and has a long fishing coastline. Local context WEFI index is important as different country has different fisheries issues and management. The framework is developed to provide a comprehensive understanding of the needs of women in the Malaysian fisheries context and later to arrive at better policy formulation to reduce gender discrimination in the fisheries sector.

## LITERATURE REVIEW

### Women in the Fisheries Sector

Women's roles in the fisheries sector cannot be underestimated. Women are involved in the capture, processing, and sale, as well as the financial aspects of fisheries, and yet many of the women's roles are overlooked and under-acknowledged in formulating fisheries management and policy development (Bennett, 2005; Zhao et al., 2013; Harper et al., 2013). Moreover, women are present in all phases of fish production, processing, and distribution, and contribute to the generation of wealth, the preservation of aquatic ecosystems, and the maintenance of households and communities in rural and coastal regions (Gopal, 2020). They make up half the workforce and play a prominent role in fisheries and aquaculture economies around the world (Food and Agriculture Organization of the United Nations, 2018). Women often help to process the fish and provide supporting roles to the male fishers.

Women's roles are often marginalized in the fisheries sector, especially in Africa and Asia Pacific Region (Bennett, 2005; Harper et al. 2017; Rahma, 2025). Less attention is paid to the role of women in the management of fisheries (Bennett, 2005; Harper et al. 2017). A lack of gender dimension in fisheries management can result in policies that miss the target of creating sustainable livelihoods for men and women in the fisheries sector.

### Women's Empowerment in Fisheries

Traditional fisheries management has often been criticized for its focus on biological and economic aspects, neglecting the social dimensions, particularly gender. Women play a crucial role in the fisheries sector globally, yet their contributions have often been underrecognized and undervalued (Grinnett, 2024; Njenga, 2024; Neilson et al., 2019). Women's contributions to fisheries are diverse, ranging from pre-harvest (e.g., net mending, bait preparation), harvest (e.g., gleaning, small-scale fishing), post-harvest (e.g., processing, marketing), to community-level management (Merayo et al., 2024; D'souza, 2020). In response to this, the Women's Empowerment in Fisheries Index (WEFI) has emerged as a key tool to measure and assess the empowerment of women in the fisheries industry. Similar to the Women's Empowerment in Agriculture Index (WEAI), WEFI focuses on multiple dimensions, including decision-making power, access to resources, control over income, leadership, and time allocation (Adam et al., 2025; Rahman et al., 2024). By quantifying empowerment levels, WEFI provides policymakers and researchers with valuable insights into gender disparities and opportunities for intervention in the fisheries sector.

Several empirical studies have focused on assessing WEFI within fisheries sector contexts. According to Gopal et al. (2020), they developed the first adaptation of WEFI to evaluate gender empowerment in fisheries in India, Indonesia, and the Philippines. Their study highlighted the need for policies that enhance women's economic independence and leadership roles in community fisheries. Next, Kleiber et al. (2019) examined gender disparities in SSF in the Pacific region, revealing that while women actively engage in fisheries, their contributions are often overlooked in national fisheries policies. The study emphasized the need for gender-inclusive data collection. Meanwhile, Lentisco & Alonso (2021) studied the WEFI in Latin America, demonstrating that women face significant barriers to accessing fishing rights, financial credit, and technological training. They proposed gender-sensitive capacity-building programs to enhance women's participation in decision-making. Biswas et al. (2022) explored the socio-economic impact of women's

empowerment in Bangladesh's fisheries sector, finding that microfinance and cooperatives significantly improve women's agency in fisheries-related businesses.

### **Barriers to Women's Empowerment in Fisheries**

Despite the progress made in measuring women's empowerment, challenges persist in terms of data limitations where many fisheries assessments lack gender-disaggregated data, making it difficult to quantify women's roles accurately (Williams et al., 2018). Another problem comes from cultural barriers. This indicates traditional gender roles in SSF often restrict women's access to decision-making and economic resources (Kleiber et al., 2019). Also, policy gaps are becoming worrisome with many national fisheries policies failing to integrate gender considerations, limiting the effectiveness of empowerment initiatives (Gopal et al., 2020). Studies have shown that Malaysian women often face challenges such as limited access to capital, technological barriers, and social norms restricting their participation in decision-making processes (Harun et al., 2023; Mangubhai & Lawless, 2021).

### **Global Application of Women Empowerment Fisheries Index**

Internationally, studies employing WEFI are relatively scarce but growing. Researchers have increasingly recognized the importance of gendered dimensions in fisheries management, particularly in small-scale and artisanal fisheries where women contribute significantly (Rahman et al., 2024). In coastal and island nations, such as the Philippines (Labayo, 2024), Indonesia (Villano et al., 2024; McDougall et al., 2022), and Bangladesh (Adam et al., 2025; Rahman et al., 2024), WEFI has been applied to evaluate women's involvement in fishing-related activities, from aquaculture and processing to marketing and governance (Matovu et al., 2024).

For instance, a study in Indonesia utilized WEFI to analyze how women's participation in small-scale fisheries influenced household income and food security (Stacey et al., 2019). The findings suggested that women who had greater access to financial resources and decision-making authority contributed more effectively to community resilience and economic stability. Similarly, in sub-Saharan Africa, WEFI-based research revealed that women's empowerment positively impacted fisheries governance, as empowered women advocated for sustainable fishing practices and conservation efforts (Freeman & Svendsen, 2022). Despite these advances, the use of WEFI remains limited compared to the WEAI, as research in fisheries management continues to focus on broader socio-economic and ecological aspects rather than gender-specific empowerment metrics (Rahman et al., 2024).

### **Women's Empowerment in Fisheries in Malaysia**

In Malaysia, women participate in aquaculture, post-harvest processing, and marketing but continue to face marginalization in decision-making and access to capital (Harun et al., 2023; Mohamed Noor, 2015; Buang et al., 2011). While gender has entered fisheries policy discourse (Choo & Williams, 2014), formal tools to assess empowerment, such as WEFI, remained underutilized. Scholars have proposed adapting agricultural empowerment models to fisheries to capture a more accurate picture of Malaysian women's agency (Mangubhai & Lawless, 2021; Weeratunge et al., 2010).

### **The Case of Sarawak**

Sarawak, as one of Malaysia's key fisheries-producing states, has a significant population involved in coastal and inland fisheries. Sarawak has 9,104 local fishermen registered with the Fisheries Department, making it the third-highest state in Malaysia, behind Sabah (25,511 fishermen) and Perak (10,950 fishermen) (Malaysia Fisheries Department, 2023). Indigenous and rural communities rely heavily on fisheries for livelihoods, and women play a substantial role in post-harvest activities, aquaculture, and small-scale processing industries. However, the researcher found no statistics related to women involved in the fisheries sector in Sarawak. Although direct applications of WEFI in Sarawak are lacking, related studies have indicated gender-based challenges such as unequal access to fisheries management programs, limited representation in cooperatives,

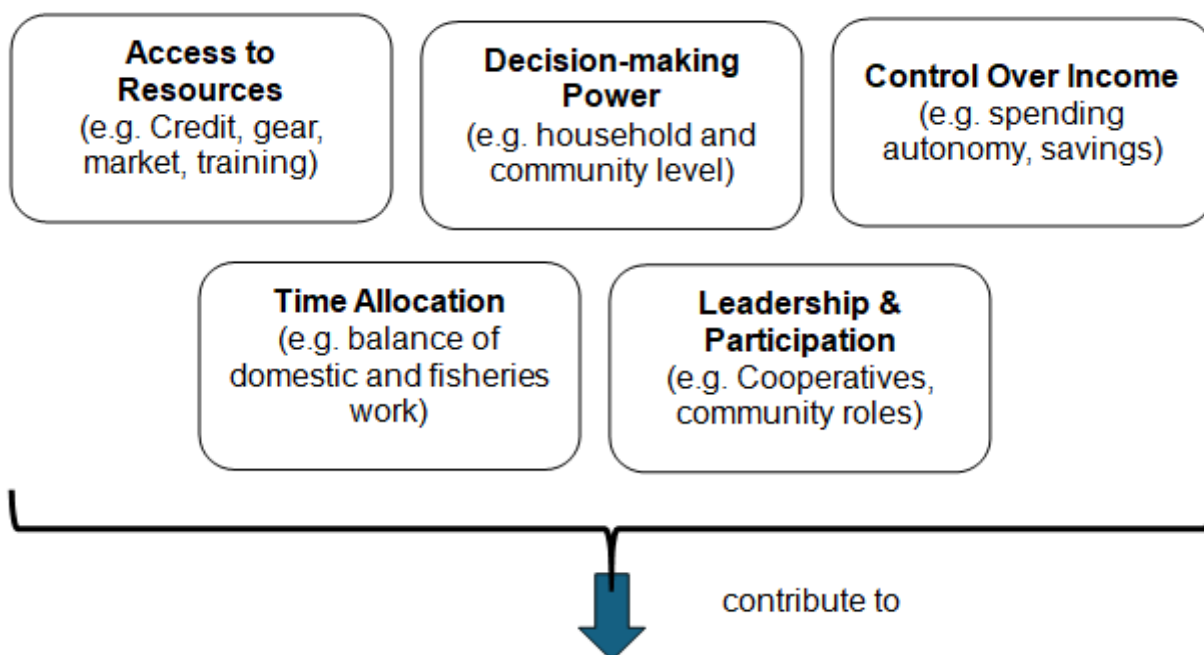
and restricted control over fisheries-related income (Kusakabe & Thongsprasert, 2022). There is growing interest among researchers in exploring gender dimensions in Sarawak's fisheries sector, with potential applications of WEFI to assess and enhance women's empowerment in coastal communities.

## Conceptual Framework

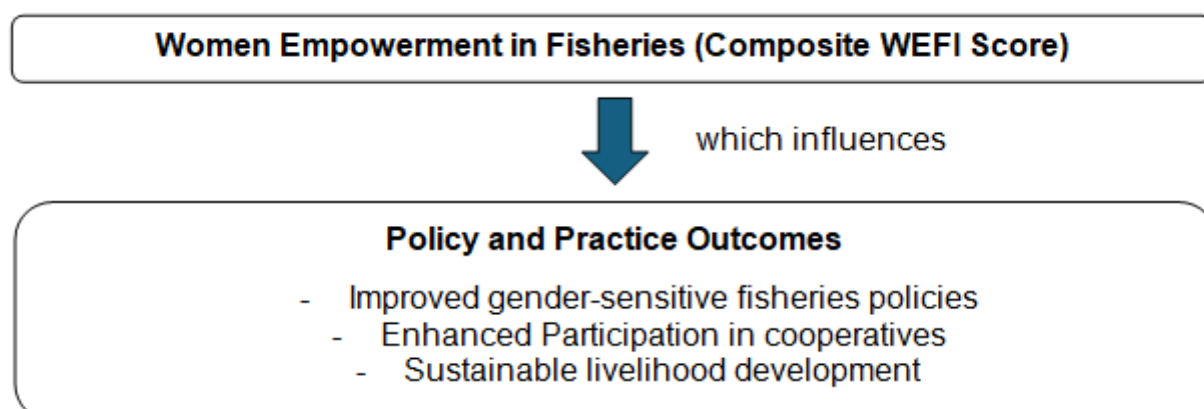
While WEFI is a promising tool for assessing women's empowerment in fisheries, its adoption remains limited compared to broader gender indices such as WEAI. Most existing studies on gender in fisheries rely on qualitative approaches, socio-economic surveys, and participatory rural appraisals rather than a standardized empowerment index (House et al. 2023). However, as gender mainstreaming gains traction in global fisheries policies, WEFI is expected to be more widely implemented, particularly in regions with strong small-scale fisheries sectors.

Thus, developing a conceptual framework for integrating WEFI in the Malaysian fisheries context will be valuable for assessing gender equality in this sector. Existing literature highlights significant contributions by women and the challenges they face in gaining economic and social recognition. Strengthening WEFI through inclusive policies, better data collection, and targeted interventions will enhance women's roles in the Malaysian fisheries context, contributing to more sustainable and equitable fisheries management.

## Independent Variables



## Dependent Variable



**Figure 3 Proposed Conceptual Framework (researchers' development)**

The conceptual framework in this study serves as the foundational structure guiding the empirical investigation into women's empowerment within the fisheries sector in Sarawak, Malaysia. It is derived from the Women's Empowerment in Fisheries Index (WEFI), which adapts the globally recognized Women's Empowerment in Agriculture Index (WEAI) to the fisheries context.

### **Theoretical Underpinning**

The framework is rooted in Kabeer's (1999) empowerment theory, which defines empowerment as the process by which individuals acquire the ability to make strategic life choices in contexts where this ability was previously denied. This definition emphasizes agency, resources, and achievements—three essential dimensions that shape the basis of empowerment assessment.

The framework comprises independent variables, a dependent variable, and the expected outcomes of empowerment:

### **Independent Variables (Five Domains of Empowerment)**

These are key dimensions that influence women's empowerment, operationalized as follows:

- **Access to Resources:** Includes women's access to financial services, fishing gear, training, and markets.
- **Decision-Making Power:** Measures involvement in decision-making at the household and community levels.
- **Control Over Income:** Evaluates autonomy in spending, saving, and using income derived from fisheries-related activities.
- **Time Allocation:** Assesses how women balance domestic responsibilities with fisheries-related work.
- **Leadership & Participation:** Captures involvement in cooperatives, fisheries groups, and other community-level leadership roles.

### **Dependent Variable**

- **Women Empowerment in Fisheries (Composite WEFI Score):** A composite index score derived from the above five domains. This serves as the principal indicator of empowerment.

### **Policy and Practice Outcomes**

- The WEFI score is posited to influence broader policy and practice outcomes, including:
  - Improved gender-sensitive fisheries policies,
  - Enhanced women's participation in cooperatives,
  - More sustainable livelihood development.

The framework is illustrated in Figure 3 of the paper as a flow model where the five domains of empowerment (independent variables) contribute to the overall WEFI score (dependent variable), which in turn influences practical and policy-related outcomes.

This framework is pivotal because:

- It provides a sector-specific, culturally contextualized tool for measuring empowerment.
- It bridges the gap in Malaysian fisheries literature, especially in Sarawak.
- It aligns with broader development agendas such as Sustainable Development Goals (SDGs) 5 (Gender Equality) and 14 (Life Below Water).

## METHODOLOGY

### Research Design

This study adopts a quantitative cross-sectional survey design to assess women's empowerment in the fisheries sector in Sarawak using the Women Empowerment Fisheries Index (WEFI). The research is exploratory and descriptive, aiming to validate and contextualize the WEFI framework within Malaysia's fisheries landscape, focusing on the unique socio-economic conditions of Sarawak.

### Sample Size and Sampling Technique

The target population comprises women involved in fisheries-related activities across coastal and inland communities in Sarawak. Using G\*Power guidelines for determining sample size from the unknown population for survey and exploratory research, a **sample size of 382 women respondents** is deemed adequate for generalization.

A **multistage sampling technique** is employed. Initially, purposive sampling is used to select active fishing districts in Sarawak. Then, stratified random sampling ensures representation from various roles (e.g., post-harvest, aquaculture, marketing).

### Unit of Analysis

The unit of analysis in this study is individual women involved in the fisheries sector in Sarawak. These include women who are actively participating in various segments of the fisheries value chain, such as:

- **Capture fisheries** (e.g., boat crew, net preparation)
- **Aquaculture** (e.g., fish farming, hatchery work)
- **Post-harvest activities** (e.g., processing, drying, salting)
- **Marketing and trading** (e.g., selling fish at markets)
- **Supportive roles** (e.g., bookkeeping, cooperative participation, logistics)

These individuals are the focus because the study aims to measure their level of empowerment using the Women Empowerment in Fisheries Index (WEFI). The analysis will be conducted at the individual level, examining personal experiences, access to resources, decision-making power, and involvement in leadership or community roles within the fisheries context.

### Research Instrument: Women Empowerment Fisheries Index (WEFI)

The WEFI tool, adapted from McDougall et al. (2022), is structured into **five core domains**:

1. **Access to Resources** (e.g., gear, credit, market)
2. **Decision-Making Power** (household and community)
3. **Control Over Income** (use and distribution of earnings)
4. **Time Allocation** (balance between fisheries and domestic work)
5. **Leadership and Participation** (in cooperatives, organizations)

Items are measured on a **5-point Likert scale**, ranging from “strongly disagree” to “strongly agree,” and validated through expert review and a pilot study.

The **Women Empowerment in Fisheries Index (WEFI)** is selected as the primary instrument for data collection due to its **theoretical robustness**, **contextual relevance**, and **empirical credibility** in measuring empowerment specifically in fisheries and aquaculture contexts. Adapted from the widely recognized Women's Empowerment in Agriculture Index (WEAI), the WEFI is grounded in **Kabeer's empowerment framework**, which defines empowerment as the ability to make strategic life choices in settings where this ability was previously denied.

WEFI is particularly suited for this study for the following reasons:

1. **Sector-Specific Relevance:** Unlike general empowerment tools, WEFI is designed specifically to reflect the unique socio-economic roles and challenges faced by women in fisheries—including capture, aquaculture, processing, and marketing.
2. **Multi-Dimensional Assessment:** It captures a holistic picture of empowerment through five domains—**access to resources**, **decision-making**, **control over income**, **time use**, and **leadership**—all of which are vital to understanding women's agency in the fisheries value chain.
3. **Empirical Rigor:** WEFI has been validated and applied in multiple international fisheries settings (e.g., Bangladesh, Indonesia, Zambia), offering a credible, comparative framework that allows for cross-country benchmarking and local adaptation.
4. **Policy Relevance:** By quantifying levels of empowerment, WEFI generates actionable insights that can inform gender-sensitive fisheries policies, development programs, and cooperative support systems in Sarawak and broader Malaysian contexts.
5. **Gap in Local Literature:** While studies on gender in fisheries exist in Malaysia, the WEFI has yet to be formally applied, thus providing a timely and innovative lens for assessing and addressing empowerment gaps within coastal and rural communities.

In summary, the use of WEFI ensures the collection of **reliable, contextually valid, and policy-relevant data**, aligning with both national development goals and international gender equality frameworks such as SDG 5 and SDG 14.

### Plan for Data Collection and Analysis

Data will be collected via **structured face-to-face interviews** conducted by trained enumerators to accommodate respondents' language preferences and literacy levels. The collected data will be analyzed using **SPSS Version 29** and **AMOS**.

### Data Analysis

1. **Descriptive Statistics:** To summarize demographic profiles and domain-specific responses.
2. **Reliability Analysis:** Cronbach's alpha is used to assess the internal consistency of WEFI domains.
3. **Exploratory Factor Analysis (EFA):** To identify underlying dimensions.
4. **Confirmatory Factor Analysis (CFA):** To validate the measurement model.
5. **Composite Index Computation:** A WEFI score will be computed based on domain weights derived from factor loadings.
6. **Inferential Analysis:** T-tests and ANOVA will assess differences across demographics and roles.

## Limitation of the Study

The study is geographically limited to Sarawak, and findings may not be generalizable to all Malaysian fisheries contexts. Additionally, the self-reported nature of empowerment can introduce **social desirability bias**, and some domains of empowerment (e.g., psychological or cultural) may be underexplored due to the index's quantitative focus.

## Significance of the Study

This study fills a critical gap in Malaysian fisheries research by adapting and validating the WEFI for local use. The results will offer **empirical insights into gender disparities**, inform **policy development**, and contribute toward achieving **SDG 5 (Gender Equality)** and **SDG 14 (Life Below Water)**. It also provides a replicable methodology for measuring women's empowerment in other regions of Malaysia and similar socio-economic contexts.

## Conclusion

The Women's Empowerment in Fisheries Index (WEFI) is a vital instrument for evaluating gender disparities and promoting inclusivity in the fisheries sector. While its usage in research remains limited, there is growing recognition of its potential, particularly in small-scale and developing fisheries economies. In Malaysia and Sarawak, the application of WEFI could fill existing research gaps, providing empirical evidence to support gender-responsive policies and interventions. Future research should prioritize the development and application of WEFI to ensure that women's contributions to fisheries are adequately recognized and supported.

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