Indonesian Annual Conference Series, Vol. 3, 2024

International Hybrid Conference on Revitalizing Global Economy for Sustainable National Development (*IHCRGESND*), Nigeria

Adaptation Patterns and Strategies of Communities in Southeast Sulawesi toward Environmental Changes

Muhammad Basri[1], Rosfiah Arsal[2]

[1]Universitas Halu Oleo, Kendari, Indonesia

[2]Universitas Pejuang Republik Indonesia, Makassar, Indonesia

***Corresponding Author**, Email: muhammadbasri275@gmail.com

Abstract

The rampant exploitation of natural resources is leading to widespread environmental damage, resulting in job losses, particularly among those whose livelihoods depend heavily on the natural environment. This research aims to investigate and delineate the ecological adaptation patterns and strategies adopted by communities in Southeast Sulawesi to confront environmental shifts. This qualitative descriptive research employed the Likert scale as qualitative parameters. The survey conducted in this research involved 1,504 respondents across 17 regencies/cities in Southeast Sulawesi using a questionnaire administered via Google Forms. Findings reveal that in the face of environmental changes or damage, individuals have adapted their practices to sustain their livelihoods and meet their basic needs.

Keywords: *Change of Environment, Double Income, Ecological Adaptation.*

INTRODUCTION

Societal Ecological Adaptation explains how human societies adapt to their physical environment to survive and thrive. This adaptation encompasses various aspects, from utilizing natural resources to developing technology and cultural practices. Cultural ecologists define this adaptation as an adjustment strategy that humans employ throughout their lives to respond to environmental and social changes (Alland, 1975; Harris, 1968; Moran, 1982). When a population or society begins to adapt to a new environment, a process of change begins, which may require a long time to complete (Moran, 1982).

One form of ecological adaptation can be observed in the livelihood patterns of a population. Examining this aspect reveals how individuals survive by adapting to their surrounding environment (Head, 2010). Changes in the natural environment contribute to shifts in the socio-economic life of the community, affecting livelihoods, adaptation strategies, and other social aspects (Asdan et al., 2023; Coracero, 2021; Wanjara & Ogembo, 2023). For instance, people whose livelihood depends on fishing are highly vulnerable to environmental changes and may even lose their jobs due to marine damages (Malakar et al., 2019).

Indonesian society features a diverse social environment that influences the variety and patterns of natural resource use. Coastal communities, such as fishermen, rely on aquatic and marine resources for their survival. The main challenge these communities face is the declining environmental carrying capacity, which contrasts sharply with the increasing use of technology to exploit natural resources unsustainably, similar to agricultural communities (Purba, 2002). According to Humphreys (2000), the exploitation of natural resources, such as mining materials, should focus on transforming natural capital into human, built, and social capital in a balanced manner (Suyartono, 2007).

To address the decline in environmental carrying capacity, fishermen are adopting strategies to maintain their income and adapt to new challenges, including ecosystem damage and fish species depletion. Effective governance of the complex social-ecological systems in which fisheries operate is crucial to understanding the conditions that shape these adaptation strategies (Makwinja et al., 2021). Community adaptation responses, such as using environmentally friendly technology and diversification, consider risk vulnerability factors, differences in the macro environment, and aspects of human, economic, and social capital, such as education, poverty, and cooperative capabilities. These responses also encompass household adaptation strategies in facing the expansion of energy infrastructure projects (Arantes et al., 2023; Malakar et al., 2019).

Previous research indicates that farmers generally possess experience and understanding of climate and environmental change phenomena. However, there are often contradictions between their experiences and the

actual phenomena, prompting them to continuously prepare adaptation steps to cope with these changes (Sheikh et al., 2024).

Further research finds that Indonesian people often practice a dual livelihood pattern. For instance, while their primary livelihood may be fishing, they also engage in secondary occupations such as trading, pincara craftsmanship, village administration, construction work, carpentry, workshop businesses, catering, smoked fish production, and cashew farming. This dual livelihood strategy helps increase community income and mitigate risks associated with their primary occupation, especially in fishing, while also aiming to boost family income (Jus et al., 2022; Ningsi et al., 2023).

METHODS

This research is a type of qualitative descriptive research presented using descriptive statistics and Likert scale qualitative parameters. Data collection was conducted through a survey method involving 1,504 respondents across 17 regencies/cities in Southeast Sulawesi. Respondents aged between 15 and 65 years old. The research instrument was a questionnaire distributed via a Google Form link. The collected data were downloaded from Google Forms in Excel format and then transferred to the Jamovi 2.4 program for analysis. Descriptive statistical analysis was used to organize and summarize the information from the numerical data, arranging it in tables as a result of the tabulation process (Silalahi, 2010) and presenting them in Tables and Figures.

RESULTS AND DISCUSSION

Respondents' Identity

1. City/Regency of Origin

Table 1. Distribution of Respondents by City/Regency of Origin

Regency/City	Frequency	Percentage (%)
Bombana	50	3.3
Buton	55	3.7
South Buton	33	2.2
Central Buton	23	1.5
North Buton	52	3.5
Kolaka	69	4.6
East Kolaka	50	3.3
North Kolaka	33	2.2
Konawe	152	10.1
Konawe Islands	21	1.4
South Konawe	108	7.2
North Konawe	93	6.2
Muna	198	13.2
West Muna	87	5.8
Wakatobi	36	2.4
Baubau	51	3.4
Kendari	393	26.1
Total	1,504	100.0

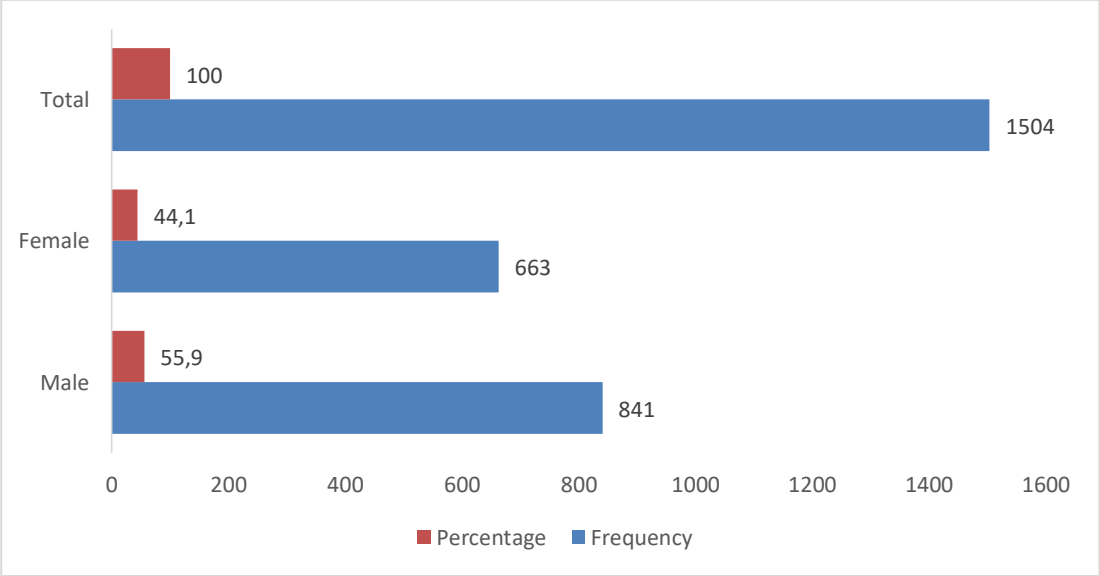
Source: Primary Data Processed, 2024

As seen in Table 1, the distribution of respondents across various districts/cities is uneven. Kendari City has the highest number of respondents with 393 (26.1%), followed by Muna Regency with 198 (13.2%), Konawe with 152 (10.1%), South Konawe with 108 (7.2%), and North Konawe with 93 (6.2%).

Kendari City represents an urban society where the main activities are related to the exchange of goods and services. The natural environment in Kendari is predominantly man-made, characterized by "stone, cement, and iron, poor in clean air" (Purba, 2002). In contrast, the other districts are more rural, with communities that have greater contact with the natural environment due to their nature-based livelihoods. This rural-urban distinction highlights a significant issue: the extensive exploitation of natural resources, particularly in mining areas (Suyartono, 2007).

2. Distribution of Respondents by Sex

Figure 1. Distribution of Respondents by Sex



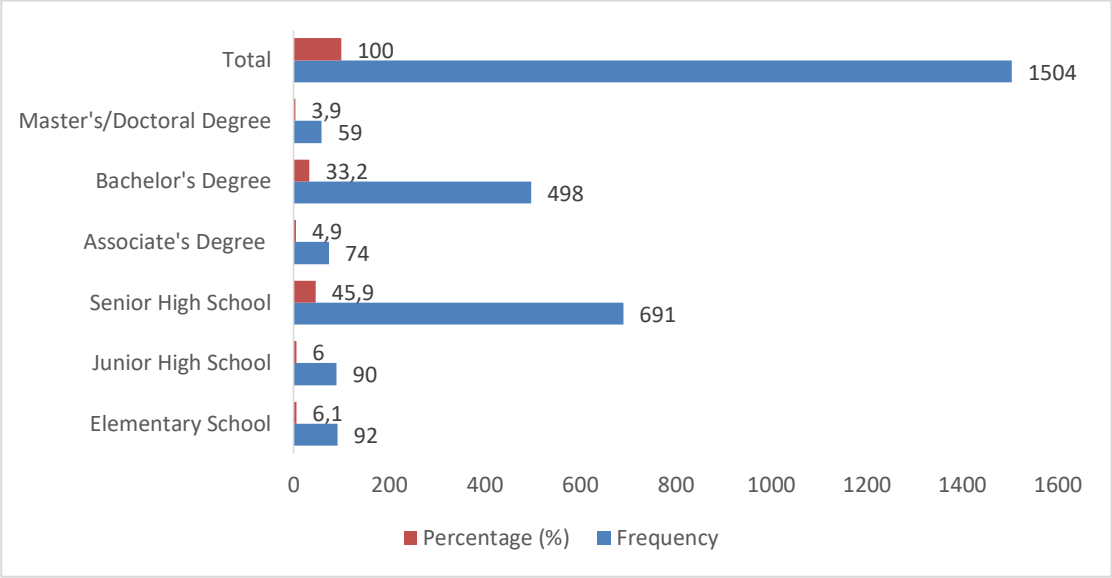
Source: Primary Data Processed, 2024

Access and control over resources, as well as climate change adaptation and mitigation activities, are predominantly managed by men within households. Men generally control shared resources, including agricultural equipment and the use of clean water. Participation in these activities is also mostly undertaken by men. While the benefits of climate change adaptation and mitigation efforts are largely experienced collectively, climate change knowledge and commodities are primarily controlled by men. Despite all gender groups adopting similar climate adaptation strategies, male farmers tend to implement these strategies more frequently than their female counterparts ((Adzawla et al., 2019; Ramadhani & Hubeis, 2020).

Therefore, policy interventions that employ group-based approaches must account for gender realities to enhance the specific abilities of both men and women in managing risks and improving welfare outcomes amid accelerating climate change (Ngigi et al., 2017). Based on Graph 1, out of 1,504 respondents, 841 (55.9%) were male, and 663 (44.1%) were female.

3. Distribution of Respondents by Education Background

Figure 2: Distribution of Respondents by Education Background

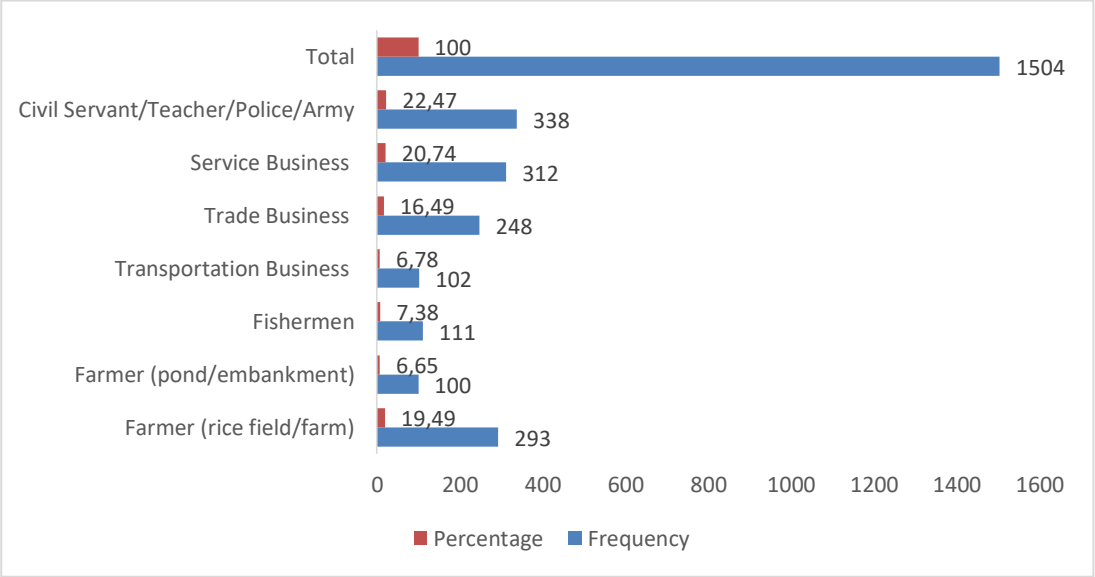


Source: Primary Data Processed, 2024

Based on the data in Figure 2, the majority of respondents had a high school education (691, or 45.9%) and a bachelor's degree (498, or 33.2%). Education is a crucial factor in determining strategies for adopting adaptation techniques to environmental changes (Adeagbo et al., 2023).With good education, individuals, including mothers, are more likely to adopt advanced adaptation techniques such as fisheries mechanization, the use of Global Positioning System (GPS) technology, and diversification. These are important adaptation responses within the community (Malakar et al., 2019).

4. Distribution of Respondents by Occupation

Figure 3. Distribution of Respondents by Occupation



Source: Primary Data Processed, 2024

Many developing countries are highly vulnerable to climate change due to their greater reliance on agriculture and related sectors. For rural communities whose main income derives from agriculture, this means their livelihoods are particularly susceptible to climate change. As a result, there is a sustainable

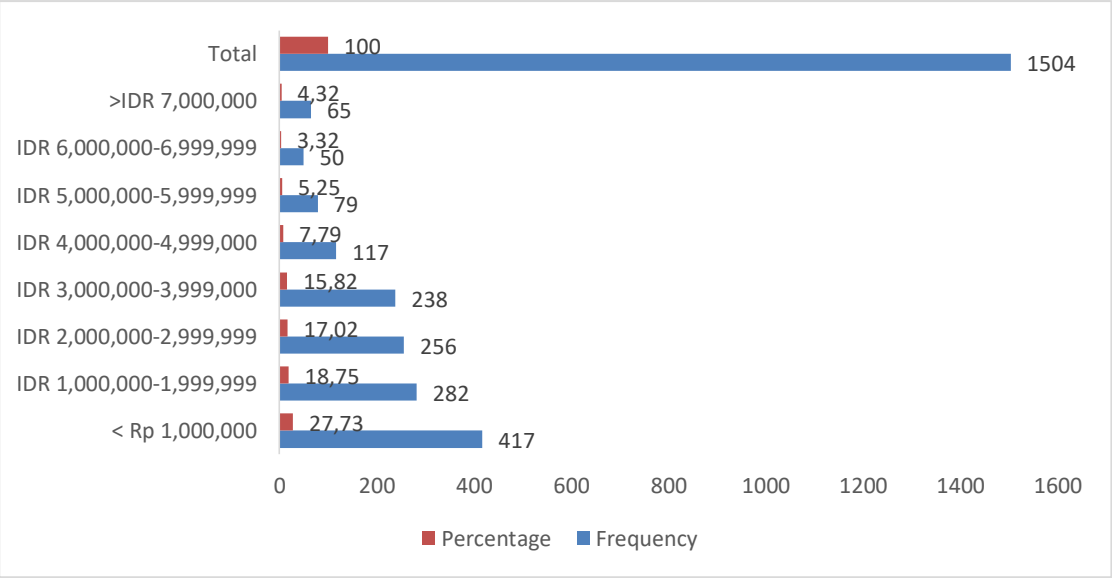
livelihood transition occurring in many developing countries, with some rural communities increasingly shifting their resources to non-agricultural work due to the adverse impacts of climate change on agriculture (Khan et al., 2024).

Based on the data in Graph 3, there are 338 respondents (22.47%) working as civil servants, TNI/POLRI, and 312 respondents (20.74%) working in other service business sectors, such as motor vehicle repair shops and house rental businesses. Additionally, 248 respondents (16.49%) are engaged in trading businesses, and 102 respondents (6.78%) work in transportation businesses.

Research indicates that service, trading, and transportation businesses serve as both primary and secondary livelihoods for some, in addition to agricultural work. These secondary livelihoods are often taken up by other family members, such as children or wives. This diversification of income sources is a mitigation strategy to counteract the impacts of natural resource exploitation and the use of technology (Awuni et al., 2023; Head, 2010; Ramadhani & Hubeis, 2020).

5. Distribution of Respondents by Income

Figure 4. Distribution of Respondents by Income

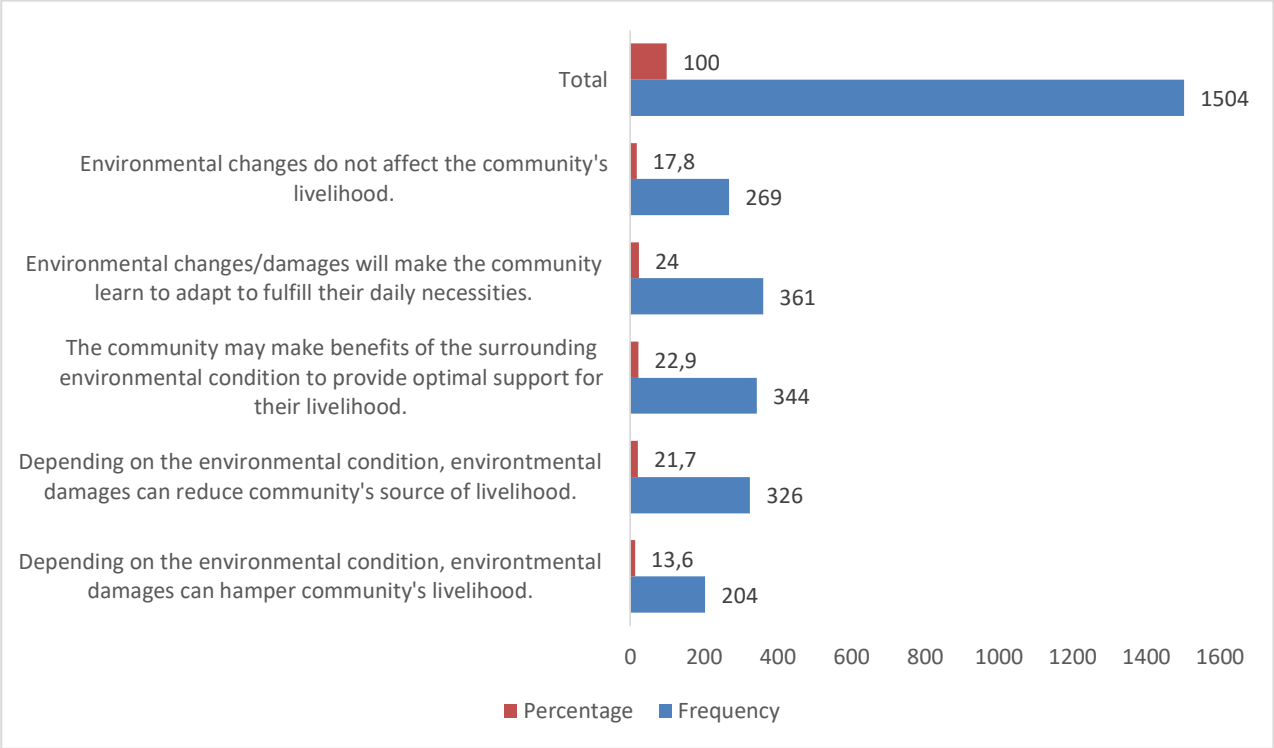


Source: Primary Data Processed, 2024

As presented in Figure 4, respondents' level of income is considered very low. To meet household living needs, many families rely on dual incomes, working as farmers while simultaneously operating kiosks and other service businesses. Ecological changes in an area, often resulting from various forms of exploitative coastal resource usage, lead to a decrease in the income of fishermen (Helmi & Satria, 2012).

Community's Pattern of Adaptation to the Environment

Figure 5. Community's Adaptation to the Environment



Source: Primary Data Processed, 2024

Data in Graph 5 shows that the majority of respondents, 361 (24%), believe that environmental change and damage, including climate change, compel people to adapt to meet their needs. For example, farmers adopt various strategies such as seeking alternative livelihoods or working in nickel mining. Research conducted in Kenya highlighted a policy aimed at increasing farmer awareness by enhancing their access to agricultural education and extension services. Policies that enhance farmers' accessibility to climate change adaptation strategies focus on improving agricultural resources, providing better extension services, increasing participation in training, accessing information about expected rainfall and temperature, and creating opportunities for alternative livelihoods beyond agriculture (Alfonso, 2021; Gebre et al., 2023).

However, a significant challenge faced by the community in the research location is limited knowledge regarding the use of technology. Many people still rely on traditional knowledge and technology, which is the result of generational interpretations of their natural environment. This traditional approach to adaptation is quite different from modern technology, which tends to be more exploratory (Purba, 2002).

Moreover, with increasingly limited agricultural land, both for rice and plantation farming, farmers are seeking other alternatives to survive, such as working in the oil palm plantation sector. Additionally, work is often shared within families, with the head of the family and housewife engaging in non-agricultural sectors to ensure household survival.

CONCLUSION

The pattern of ecological adaptation observed in communities in Southeast Sulawesi reflects their ability to leverage environmental conditions for survival and to adapt to environmental changes or damage to meet their life's needs. Society adopts various strategies to adapt, including enhancing knowledge and skills, as well as implementing a dual income pattern strategy.

REFERENCES

Adeagbo, O. A., Bamire, A. S., Akinola, A. A., Adeagbo, A. D., Oluwole, T. S., Ojedokun, O. A., Ojo, T. O., Kassem, H. S., & Emenike, C. U. (2023). The level of adoption of multiple climate

change adaptation strategies: Evidence from smallholder maize farmers in Southwest Nigeria. *Scientific African*, *22*(November), e01971.

Adzawla, W., Azumah, S. B., Anani, P. Y., & Donkoh, S. A. (2019). Gender perspectives of climate change adaptation in two selected districts of Ghana. *Heliyon*, *5*(11), e02854.

Alfonso, G. P. (2021). Assessing the Climate Change Adaptations of Upland Farmers: A Case of La Trinidad, Benguet, Philippines. *Indonesian Journal of Social and Environmental Issues* (*IJSEI*), 2(2), 129-142.

Alland, A. (1975). *). Evolution and Human Behaviour: An Introduction to Darwinian Anthropology*. Routledge.

Arantes, C. C., Laufer, J., Mayer, A., Moran, E. F., Sant' Anna, I. R. A., Dutka-Gianelli, J., Lopez, M. C., & Doria, C. R. C. (2023). Large-scale hydropower impacts and adaptation strategies on rural communities in the Amazonian floodplain of the Madeira River. *Journal of Environmental Management*, *336*(December 2022), 117240.

Asdan, A., Syafri, S., & Jaya, B. (2023). Strategi Adaptasi Sosial Ekonomi Masyarakat Lokal Pada Sekitar Kawasan Pertambangan PT Indonesia Weda Bay Park. *Urban and Regional Studies Journal*, *6*(1), 58–70.

Awuni, S., Adarkwah, F., Ofori, B. D., Purwestri, R. C., Huertas Bernal, D. C., & Hajek, M. (2023). Managing the challenges of climate change mitigation and adaptation strategies in Ghana. *Heliyon*, *9*(5), e15491.

Coracero, E.E. (2021). Potential Climate Change Adaptation Strategies Suitable in the Philippine Setting. *Indonesian Journal of Social and Environmental Issues* (*IJSEI*), 2(1), 1-6.

Gebre, G. G., Amekawa, Y., Fikadu, A. A., & Rahut, D. B. (2023). Farmers′ use of climate change adaptation strategies and their impacts on food security in Kenya. *Climate Risk Management*, *40*(February), 100495.

Harris, M. (1968). *The Rise of Anthropological Theory: A History of Theories of Culture*. Rowman Altamira.

Head, L. (2010). Cultural ecology: Adaptation - retrofitting a concept? *Progress in Human Geography*, *34*(2), 234–242.

Helmi, A., & Satria, A. (2012). Fishermen Adaptation Strategy to Ecological Change. *So Social Humanities Series*, *16*(1), 68–78.

Jus, J., Fitriyana, F., & Gunawan, B. I. (2022). Pola Nafkah Ganda Keluarga Nelayan Di Desa Penyinggahan Ilir Kecamatan Penyinggahan Kabupaten Kutai Barat. *Jurnal Perikanan Unram*, *12*(3), 428–437.

Khan, N. A., Shah, A. A., Chowdhury, A., Wang, L., Alotaibi, B. A., & Muzamil, M. R. (2024). Rural households' livelihood adaptation strategies in the face of changing climate: A case research from Pakistan. *Heliyon*, *10*(6), e28003.

Makwinja, R., Kaunda, E., Mengistou, S., Alemiew, T., Njaya, F., Kosamu, I. B. M., & Kaonga, C. C. (2021). Lake Malombe fishing communities' livelihood, vulnerability, and adaptation strategies. *Current Research in Environmental Sustainability*, *3*(June), 100055.

Malakar, K., Mishra, T., & Patwardhan, A. (2019). Factors linked with adaptation in the Indian marine fishing community. *Ocean and Coastal Management*, *171*(December 2018), 37–46.

Moran, E. F. (1982). *Environmental Social Science: Human - Environment interactions and Sustainability*. John Wiley & Sons.

Ngigi, M. W., Mueller, U., & Birner, R. (2017). Gender Differences in Climate Change Adaptation Strategies and Participation in Group-based Approaches: An Intra-household Analysis From Rural Kenya. *Ecological Economics*, *138*(April 2016), 99–108.

Ningsi, I., Gafaruddin, A., & Yusria, W. O. (2023). Analysis of Fishermen ' s Multiple Livelihood Patterns In Muara Sampara Village , Kapoiala District Konawe Regency. *International Journal of Economics, Business and Innovation Research*, *02*(05), 132–144.

Purba, J. (2002). *Pengelolaan Lingkungan Sosial*. Jakarta: Yayasan Obor Indonesia.

Ramadhani, F. P., & Hubeis, A. V. S. (2020). Analisis Gender dalam Upaya Adaptasi dan Mitigasi Perubahan Iklim. *Jurnal Sains Komunikasi Dan Pengembangan Masyarakat [JSKPM]*, *4*(2), 155–166.

Sheikh, Z. A., Ashraf, S., Weesakul, S., Ali, M., & Hanh, N. C. (2024). Impact of climate change on farmers and adaptation strategies in Rangsit, Thailand. *Environmental Challenges*, *15*

(December 2023), 100902.

Silalahi, U. (2010). *Metode Penelitian Sosial*. Bandung: PT. Refika Aditama.

Suyartono. (2007). *Pertambangan Berwasan Lingkungan Peranannya Bagi Pertumbuhan Ekonomi dan Perbangunan Berkelanjutan*. Jakarta: KORPUS-Majalah Tambang.

Wanjara, A. O. ., & Ogembo, P. O. (2023). Impact of Climate Change on Health and Livelihoods of Pastoral Communities in Kenya: A Case of North Eastern Region. *Indonesian Journal of Social and Environmental Issues* (*IJSEI*), 4(3), 299-315.