



# Fishery Livelihood Adaptation on Climate Change: A Bibliometric Analysis and Review

Muhammad Izzudin<sup>1\*</sup>

<sup>1</sup> *Sociology Department, Sriwijaya University, Indonesia*

\*Corresponding author. Email: [muhammadizzudin@fisip.unsri.ac.id](mailto:muhammadizzudin@fisip.unsri.ac.id)

## ABSTRACT

The primary objective of this research is to provide a high-level overview of potential impacts and details of ongoing and completed adaptation measures on aquatic and marine ecosystems and the livelihoods they support as a result of climate change. Changes in acidity, sea temperature, and circulation patterns, the frequency and intensity of extreme events, sea level rise, and associated ecological changes will all have an impact on fisheries and aquaculture as a result of climate change. This method used a bibliometric analysis using VoS Viewer and collected articles from the Scopus Database for the years 2014–2022. The results show that (1) the number of documents is rising, but the citations go down temporarily; (2) the countries with the most influence are the United States, United Kingdom, and Canada; (3) the authors most cited are Cheung, W.W.L., and Allison, E.H.; (4) the research most influenced is the livelihoods approach and management of small-scale fisheries (2001) by Allison, E.H., and Ellis, F. (5) The most frequently used keywords are climate change, fisheries, livelihood, human, animal, ecosystem, environmental protection, adaptive management, fishery management, conservation of natural resources, and fish. Therefore, future research related to fishery livelihood due to climate change should include several themes, including social-ecological systems, remote sensing, artisanal fisheries, the Pacific Islands, and coastal impact.

**Keywords:** Livelihood, Fishery, Climate Change, Bibliometric Analysis, Scopus Database

## 1. INTRODUCTION

Climate change poses a formidable challenge to the sustainability of fisheries and the livelihoods of millions of people worldwide who depend on them [1]; [2]. As global temperatures rise, oceans become more acidic, and weather patterns become increasingly unpredictable, the need for adaptive strategies within the fisheries sector has never been more critical [3]. This paper presents a comprehensive bibliometric analysis and review [4]; [5], shedding light on the evolving landscape of research and adaptation efforts within the realm of 'Fishery Livelihood Adaptation on Climate Change.'

Fisheries have long played a pivotal role in global food security, employment, and economic development, with millions of people depending on them for their daily sustenance and livelihoods [6]; [7]. However, the impacts of climate change, such as rising sea levels, ocean warming, and altered marine ecosystems, have disrupted traditional fishing patterns and threatened the very foundation of these communities [8]; [9]. Recognizing the urgency of the situation, researchers, policymakers, and practitioners have been actively engaged in addressing these challenges and seeking innovative solutions to help fishery-dependent communities adapt to the new climate realities.

This bibliometric analysis and review delve into the rich tapestry of scholarly research and practical interventions aimed at enhancing fishery livelihood adaptation in the context of climate change [10]. By examining the extensive body of literature and identifying key thematic areas, influential publications, and global research networks, this study offers a comprehensive overview of the field's evolution [11]. It not only maps the current state of knowledge but also identifies gaps in research, potential areas for future exploration, and the most promising strategies for ensuring the resilience and sustainability of fishery-dependent communities in a rapidly changing world.

In this exploration, we delve into the critical dimensions of climate adaptation within fisheries, including the development of climate-resilient fishing practices, the role of community-based management, the impact of policy interventions, and the integration of traditional ecological knowledge. By synthesizing these insights, our analysis seeks to contribute to the growing body of knowledge aimed at safeguarding the invaluable fisheries resources while simultaneously improving the well-being of those who rely on them. As we navigate the complex intersection of climate change and fisheries, this review serves as a compass, guiding us towards a more sustainable and adaptive future for fishery-dependent communities worldwide.

By reviewing the impact of policy interventions and community-based management practices, the study offers insights into what works and what doesn't in the context of fishery livelihood adaptation. This information can inform policymakers and practitioners when designing and implementing climate-resilient strategies for fisheries management. The study likely incorporates a global perspective by examining research from various regions. This enables a broader understanding of how climate change impacts fisheries and livelihoods in different parts of the world, potentially highlighting region-specific challenges and solutions.

## **2. OBJECTIVES**

By examining the key trends, seminal works, and emerging insights in this field, this study aims to provide a valuable synthesis of knowledge, offering a deeper understanding of the ongoing efforts to safeguard both fishery resources and the communities that rely on them in the face of a changing climate.

## **3. METHODS**

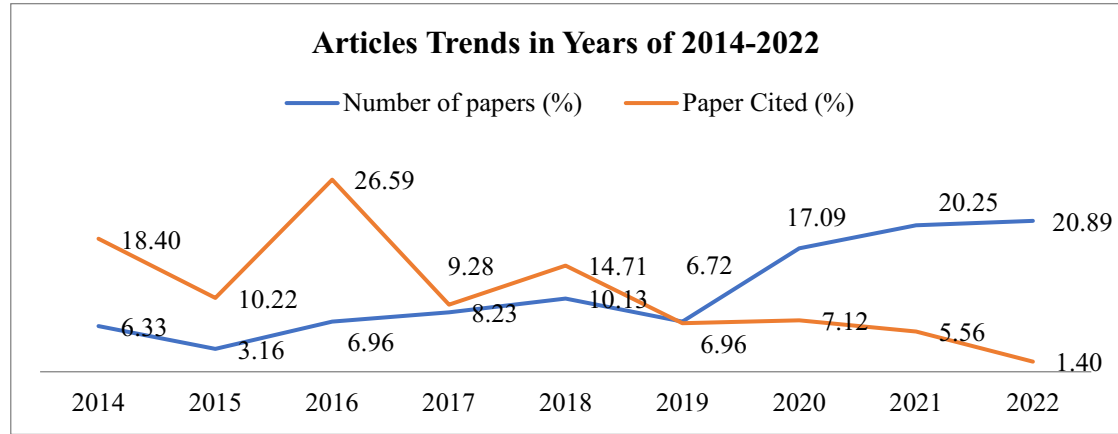
This article employs a bibliometric analysis methodology [12]. The aforementioned technique has garnered increased attention as a valuable tool for doing quantitative analyses in order to attain a more comprehensive comprehension of the literature. Data obtained from the Scopus Database and accessed on the 10th of July 2023 with a total of 158 articles obtained. At present, the Scopus platform stands as the most extensive repository of scholarly articles, including a wide range of disciplines in the realms of science and social science. According to [13]; [14], Scopus exhibits more consistency and conformance compared to other prominent indexers, such as the Web of Science and Google Scholar. The range of years collected is in the last 7 years, starting from 2014 -2022 to see the latest developments related to the phenomenon of fishermen's livelihoods due to global climate change. The language articles gathered are in English only.

In the data collection stage, 484 documents related to the topics of open space and policy were found. The documents metadata used in the analysis stage included author(s), title, abstract, citation, publication year, references, and sources. Data were analyzed using Bibliometric analysis using VOSviewer version 1.6.19 software[11] issued by the Center for Science and Technology Studies, Leiden University, The Netherlands and Microsoft excel to view cross-tabulations and descriptive analysis. The bibliometric analysis contains four things, namely, the trend in the number of publications, the countries that do the most research, the authors with the most citations and keywords to see future research.

## 4. FINDINGS & DISCUSSION

### 4.1. Articles Trend

**Figure 1.** Articles Trends in Years of 2014-2022



Source: Author Analysis from Scopus Database, 2023

The trend observed from Figure 1 is a gradual increase in research interest over time. This could indicate that this field has gained more attention in recent years. Moreover, from 2018 to 2022, there are noticeable acceleration. This might suggest that research in this field is rapidly growing, possibly due to increased awareness of the importance of fishery livelihood adaptation in the context of climate change and sustainability.

### 4.2. Countries/Organizations Collaboration Analysis

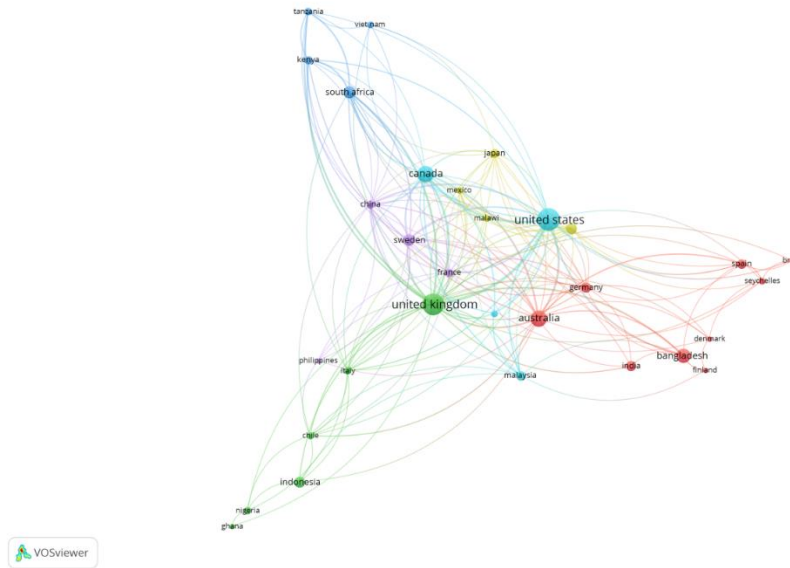
The 10 most influential countries in writing this theme can be seen from the comparison between the number of citations divided by the number of documents (cited/documents), namely Sweden, Japan, USA, China, Bangladesh, France, United Kingdom, Italy, Kenya and Denmark (See Table 1).

**Table 1.** 10 Ranks of Countries/Organizations Collaboration

No	Country	Documents (D)	Citations (C)	C/D
1	Sweden	12	584	48.67
2	Japan	7	300	42.86
3	United States	42	1793	42.69
4	China	6	201	33.50
5	Bangladesh	17	513	30.18
6	France	6	176	29.33
7	United Kingdom	40	1133	28.33
8	Italy	5	139	27.80
9	Kenya	6	161	26.83
10	Denmark	3	78	26.00

Source: Author Analysis from Scopus Database, 2023

**Figure 2.** The influential countries link graph using VOSViewer



Source: VOSViewer Graph Analysis, 2023

### 4.3. Influence Authors

It's important to note that the influence of authors can vary depending on the field of study, the specific topics they have researched, and their contributions to academic literature. Here's a brief overview of some of the authors you've listed and their potential areas of influence: Jacobs Z.L. is known for research related to fisheries, climate change, or other environmental topics. Popova E. is known for research related to environmental topics. Taylor S.F.W. is known for research related to fisheries, climate change, or other environmental topics. Allison E.H. is a prominent figure in the fields of fisheries and food security. Her work often focuses on small-scale fisheries, vulnerability, and adaptation to environmental changes. Painter S.C. may be recognized for contributions to marine science, oceanography, or related disciplines, particularly in the context of ocean ecosystems and climate change. Roberts, M.J., is known for research related to environmental topics. Jebri F. is known for research related to environmental topics. Daw T.M. is known for research related to fisheries, social-ecological systems, and the impacts of climate change on coastal communities. Levin P.S. is likely influential in marine ecology and conservation, focusing on sustainable fisheries management and marine ecosystem health. Mumby, P.J., is a renowned coral reef ecologist who has made significant contributions to understanding the dynamics of coral reef ecosystems, especially in the context of climate change and conservation. Saunders M.I. is known for research related to marine ecosystems, coastal ecology, or other topics within environmental science. Frölicher T.L. is likely influential in climate science and oceanography, particularly for research related to ocean warming and its effects. Kelly S. is known for research related to environmental topics. Kizenga H. is known for research related to fisheries, particularly in regions where small-scale fisheries are a significant part of the local economy. Halpern, B.S., is a notable figure in marine conservation and ecosystem management, focusing on the intersection of science, policy, and conservation efforts.

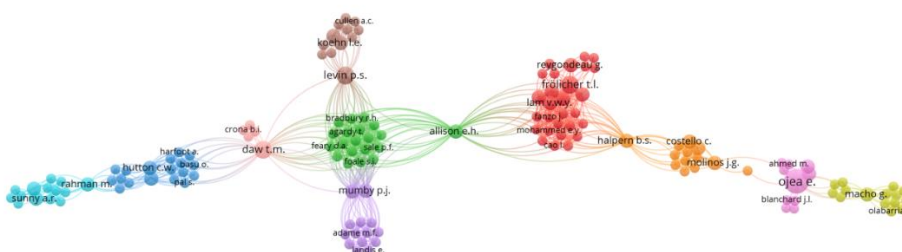
**Table 2.** 15 Ranks of Influence Authors listed

No	author	documents	citations	total link strength
1	Jacobs Z.L.	4	40	52
2	Popova E.	5	39	50
3	Taylor S.F.W.	4	37	48

4	Allison E.H.	2	126	44
5	Painter S.C.	4	37	42
6	Roberts M.J.	4	32	41
7	Jebri F.	3	35	40
8	Daw T.M.	3	211	39
9	Levin P.S.	3	111	36
10	Mumby P.J.	2	111	36
11	Saunders M.I.	2	111	36
12	Frölicher T.L.	3	66	35
13	Kelly S.	3	27	35
14	Kizenga H.	3	32	34
15	Halpern B.S.	2	161	32

Source: Author Analysis from Scopus Database, 2023

**Figure 3.** The influential Authors link graph using VOSViewer



Source: VOSViewer Graph Analysis, 2023

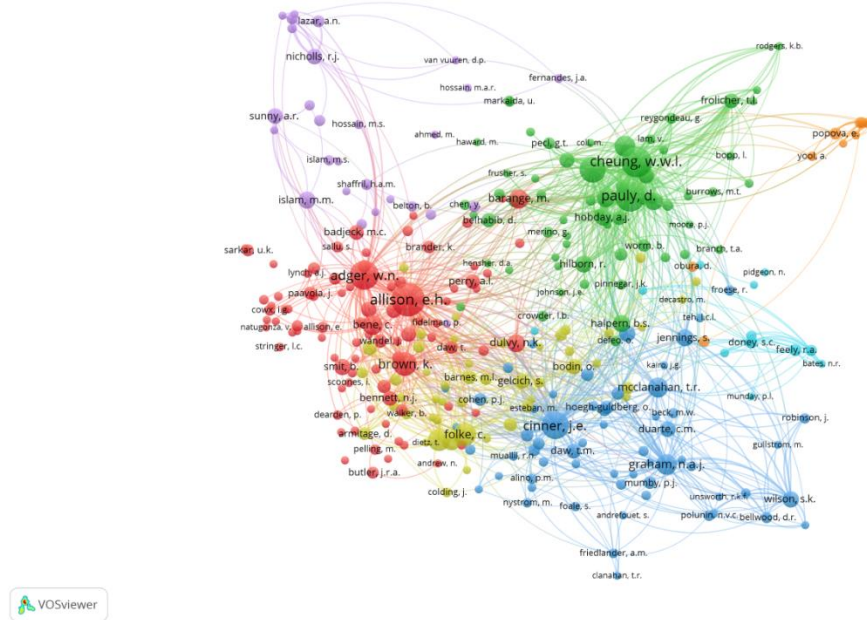
**Table 3.** 15 Ranks of most Author Cited

No	author	citations	total link strength
1	Cheung, W.W.L.	139	11170
2	Allison, E.H.	170	10693
3	Cinner, J.E.	113	9654

<b>4</b>	Pauly, D.	135	8859
<b>5</b>	Adger, W.N.	125	7760
<b>6</b>	Sumaila, U.R.	100	7123
<b>7</b>	Graham, N.A.J.	66	5817
<b>8</b>	Brown, K.	86	5747
<b>9</b>	Lam, V.W.Y.	66	5444
<b>10</b>	Folke, C.	80	5287
<b>11</b>	Berkes, F.	76	4946
<b>12</b>	Mcclanahan, T.R.	59	4892
<b>13</b>	Jennings, S.	44	3736
<b>14</b>	Barange, M.	56	3729
<b>15</b>	Watson, R.	49	3590

Source: Author Analysis from Scopus Database, 2023

**Figure 4.** The Most Cited Authors link graph using VOSViewer



Source: VOSViewer Graph Analysis, 2023

**4.4. Influential Research Highlight**

**Table 4.** 10 Ranks of Influential Research Highlight

No	cited reference	citations	total link strength
1	Allison, E.H., Ellis, F., The Livelihoods Approach and Management of Small-Scale Fisheries (2001) <i>Mar. Policy</i> , 25, Pp. 377-388	8	6
2	Ojea, E., Lester, S.E., Salgueiro-Otero, D., Adaptation Of Fishing Communities To Climate-Driven Shifts In Target Species (2020) <i>One Earth</i> , 2, Pp. 544-556	4	6
3	Ostrom, E., A General Framework For Analyzing Sustainability Of Social-Ecological Systems (2009) <i>Science</i> , 325, Pp. 419-422	4	4
4	Smit, B., Wandel, J., Adaptation, Adaptive Capacity And Vulnerability (2006) <i>Global Environmental Change</i> , 16 (3), Pp. 282-292	4	0
5	Adger, W.N., Social Vulnerability To Climate Change And Extremes In Coastal Vietnam (1999) <i>World Dev.</i> , 27, Pp. 249-269	3	0
6	Badjeck, M.C., Allison, E.H., Halls, A.S., Dulvy, N.K., Impacts Of Climate Variability And Change On Fishery-Based Livelihoods (2010) <i>Mar. Policy</i> , 34, Pp. 375-383	3	7
7	Cinner, J.E., Barnes, M.L., Social Dimensions Of Resilience In Social-Ecological Systems (2019) <i>One Earth</i> , 1, Pp. 51-56	3	2
8	Galappaththi, E.K., Ford, J.D., Bennett, E.M., A Framework For Assessing Community Adaptation To Climate Change In A Fisheries Context (2019) <i>Environ. Sci. Policy</i> , 92, Pp. 17-26	3	4
9	Marshall, N.A., Tobin, R.C., Marshall, P.A., Gooch, M., Hobday, A.J., Social Vulnerability Of Marine Resource Users To Extreme Weather Events (2013) <i>Ecosystems</i> , 16, Pp. 797-809	3	2
10	Plaganyi, E., Climate Change Impacts On Fisheries (2019) <i>Science</i> , 363, Pp. 930-931	3	5

Source: Author Analysis from Scopus Database, 2023

[15] in his paper argue that the use of the sustainable livelihoods strategy is utilized to comprehend the techniques employed by artisanal fisherfolk in low-income nations who face the challenge of variable fisheries resources, as a means to address poverty reduction. His paper elucidates the livelihood concept and examines its implications for conventional fisheries management policy in underdeveloped nations. There is a contention that both state-led management and certain emerging approaches, such as community or territorial use-rights, may lead to management directives that are incompatible with resource conservation, as well as the social and economic objectives of management, if they are based on an inadequate comprehension of livelihoods.

[16] in his paper argue that the phenomenon of climate change is resulting in notable alterations in the geographical ranges of marine species, hence producing disruptions in the livelihoods of fishers and fishing communities. The aforementioned alterations have a broad impact on various fishing practices, ranging from small-scale to industrial operations. Consequently, they have significant consequences for the sustenance of individuals, the functioning of economies, and the whole fabric of society within the seafood supply chain.

[17] argue that networks serve as valuable tools for characterizing ecological systems, enabling the representation of the constituent parts and their interrelationships. The utilization of network analysis in the context of ecosystems offers a theoretical framework for evaluating the impacts of disturbances on the community scale. The advent of networks has facilitated the identification of commonalities across seemingly distinct systems, which, despite their diverse characteristics, may exhibit comparable patterns of creation and/or similar underlying mechanisms that enable their functionality.

[18] argue that in several disciplines within the social sciences, adaptations are seen as reactions to the risks that arise from the interplay between environmental dangers and the susceptibility or ability of humans to adapt. Adaptation assessments have been conducted in the realm of climate change for several specific objectives. Impact assessments make the assumption of adaptations in order to quantify the damages that might occur under longer-term climatic scenarios, both with and without modifications. The purpose of evaluations pertaining to certain adaptation alternatives is to determine the most favorable measures. Vulnerability indices aim to offer comparative vulnerability assessments for nations, regions, or communities.

[19] argue that the vulnerability discussed as a susceptibility of people or groups to experience livelihood stress due to the consequences of environmental change. The phenomenon under consideration is comprised of both individual and social components that may be analyzed separately, yet are interconnected through the political economy of markets and institutions. The findings of the study conducted in coastal northern Vietnam indicate that the initial level of social vulnerability is influenced by certain institutional and economic factors related to Vietnam's shift from central planning to a market-oriented economy. Specifically, these factors include the erosion of collective efforts to mitigate the impact of extreme events and a growing income disparity.

[20] research aims to analyze the many paths through which climatic variability and change affect the livelihoods of fisher folk at both the household and community levels. The study argues for discerning existing and prospective adaptation techniques while also examining the broader ramifications for local livelihoods, fisheries management, and climate policy.

[21] argues resilience is commonly acknowledged as the ability to endure, assimilate, manage, and adapt to evolving societal or environmental circumstances while preserving fundamental aspects of structure, functionality, and identity. Understanding the implications of environmental changes, particularly climate change, on socio-ecological systems necessitates a comprehensive examination of the crucial role played by the social aspects of resilience.

[22] argues that the integrated framework employed in this study draws upon conceptual material derived from resilience theories in social-ecological systems (SES) and human development resilience. This framework is utilized to assess and evaluate community responses to climate change within the



context of a fisheries environment. The paradigm conceptualizes resilience as the collective outcome of coping, adapting, and changing, acknowledging resilience as both a system's potential and a dynamic process. The aforementioned comprehension of resilience aligns with the three fundamental notions of resilience in development, namely resistance, rootedness, and resourcefulness. These concepts are further enhanced by including "place-based elements," which encompass collective action, institutional frameworks, agency, and indigenous and local knowledge systems.

[23] findings that those who are more sensitive to changes in resources are not always the ones who are most susceptible. It is possible that their sensitivity is balanced by their ability to adjust to these changes. The study provides empirical evidence supporting the notion that adaptive capability should be a central priority in climate adaptation strategy.

[24] argues that the potential vulnerability of future fisheries output is heightened due to the accelerating rate of ocean warming caused by human climate change, surpassing initial predictions.

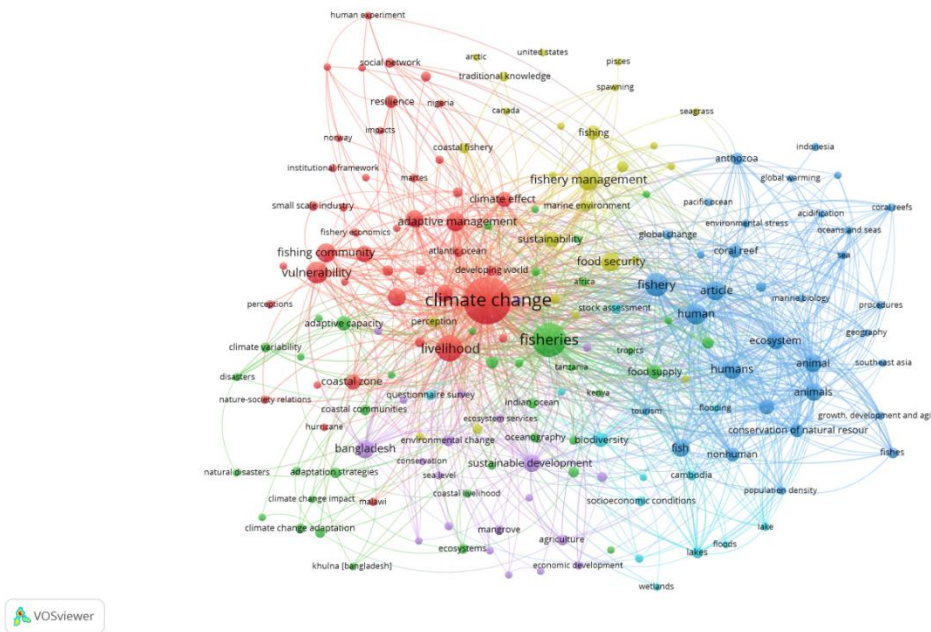
#### 4.5 Keywords Science Mapping

**Table 5.** 10 Ranks of Keyword Science Mapping

No	keyword	occurrences	total link strength
1	climate change	115	1005
2	fisheries	58	622
3	livelihood	36	410
4	human	22	367
5	animal	15	282
6	ecosystem	14	275
7	environmental protection	12	222
8	adaptive management	18	208
9	fishery management	24	205
10	conservation of natural resources	10	201
11	fish	16	193

Source: Author Analysis from Scopus Database, 2023

**Figure 5.** The keywords link graph using VOSViewer



Source: VOSViewer Graph Analysis, 2023

The phrase "Climate Change" is frequently employed by scholars to denote enduring alterations in temperature, weather patterns, and atmospheric conditions that are instigated by human activity, with a primary focus on the release of greenhouse gases. The term "fisheries" encompasses the sector and methodology involved in the capture, processing, and commercialization of fish intended for human use, with a particular focus on its economic and ecological importance. The term "livelihood" pertains to the methods by which individuals generate income or sustain their fundamental necessities. Within the realm of fisheries, this phenomenon underscores the reliance of communities on fishing as a crucial determinant of their economic prosperity. Academic: Scholars frequently direct their attention towards examining the involvement of people in climate change and fisheries, delving into the ways in which human activities exert influence on the environment, ecosystems, and livelihoods. The phrase "animal" encompasses a broad range of organisms, including fish and other aquatic species. It is frequently employed in discussions pertaining to the ecological functions and conservation efforts associated with these organisms. The concept of ecosystems is a subject of regular scholarly examination, whereby researchers delve into the intricate interconnections between species and their surrounding surroundings.

This academic exploration places particular emphasis on the significance of ecosystems in comprehending the effects of climate change and in effectively managing fisheries. The term "Environmental Protection" encompasses the overarching objective of preserving natural resources and ecosystems among many environmental issues, such as climate change and the sustainable management of fisheries. Scholars investigate adaptive management systems that facilitate adaptability and knowledge acquisition in the presence of uncertainty, a critical aspect in the realms of climate change adaptation and fisheries management. Fishing management refers to the set of techniques and policies implemented to effectively control and sustainably oversee fishing resources. The primary objective is to strike a balance between ecological conservation and economic considerations. The conservation of natural resources, such as fish stocks, is frequently underscored by scholars due to its significance in guaranteeing their availability for future generations and preserving biodiversity. The term "fish" pertains primarily to the role of fish as a fundamental element within the context of fisheries. Scholars investigate several facets of fish biology, ecology, and behavior, with a special focus on their reactions to climate change and anthropogenic influences.

## 5. CONCLUSION

Our analysis has revealed a multitude of trends in research related to fishery livelihood adaptation in the context of climate change. These trends encompass diverse thematic areas, including climate-resilient fishing practices, community-based management, policy interventions, and the integration of traditional ecological knowledge. These trends illustrate the interdisciplinary nature of this field, emphasizing the need for collaborative efforts to address the complex challenges at hand.

Our analysis underscores the importance of translating research findings into actionable policies and practical strategies. The reviewed literature has shown that effective climate adaptation in fisheries necessitates a combination of local and global interventions, adaptive management, and the preservation of traditional knowledge. Policymakers, practitioners, and stakeholders can draw valuable insights from these studies to enhance the resilience of fishery-dependent communities.

In conclusion, this study has provided a panoramic view of the existing scholarship in the realm of fishery livelihood adaptation to climate change. It serves as a foundation for further inquiry and underscores the urgency of addressing climate-related challenges within the fisheries sector. Through continued research and concerted efforts, we can aspire to build a more resilient and sustainable future for fishery-dependent communities worldwide.

## 6. COMPETING INTEREST STATEMENT

This article is free from any conflict of interest regarding the data collection, analysis, and the publication process itself.

## 7. AUTHORS' CONTRIBUTIONS

Muhammad Izzudin is the main author of this article and contributed significantly to this research.

## 8. ACKNOWLEDGMENTS

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## 9. REFERENCES

- [1] L. Connolly-Boutin and B. Smit, "Climate change, food security, and livelihoods in sub-Saharan Africa," *Regional Environmental Change*, vol. 16, no. 2, pp. 385–399, 2016.
- [2] O. S. Oduniyi, "Implication of climate change on livelihood and adaptation of small and emerging maize farmers in the North West province of South Africa," *A thesis submitted by the requirements for the degree of Doctor of Philosophy in the subject agriculture at the University of South Africa*, 2018.
- [3] R. J. Sulu *et al.*, "Livelihoods and fisheries governance in a contemporary Pacific Island setting," *PLoS One*, vol. 10, no. 11, p. e0143516, 2015.
- [4] N. J. Van Eck and L. Waltman, "Visualizing bibliometric networks," in *Measuring scholarly impact*, Springer, 2014, pp. 285–320.
- [5] I. Zupic and T. Čater, "Bibliometric methods in management and organization," *Organizational research methods*, vol. 18, no. 3, pp. 429–472, 2015.
- [6] M.-C. Badjeck, E. H. Allison, A. S. Halls, and N. K. Dulvy, "Impacts of climate variability and change on fishery-based livelihoods," *Marine policy*, vol. 34, no. 3, pp. 375–383, 2010.
- [7] R. J. Stanford, B. Wiryawan, D. G. Bengen, R. Febriamansyah, and J. Haluan, "Improving livelihoods in fishing communities of West Sumatra: More than just boats and machines," *Marine Policy*, vol. 45, pp. 16–25, 2014.
- [8] N. Matsue, T. Daw, and L. Garrett, "Women fish traders on the Kenyan coast: livelihoods, bargaining power, and participation in management," *Coastal Management*, vol. 42, no. 6, pp. 531–554, 2014.
- [9] M. A. R. Hossain, M. Ahmed, E. Ojea, and ..., "Impacts and responses to environmental change in coastal livelihoods of south-west Bangladesh," *Science of the total ...*, 2018.
- [10] M. M. Kessler, "Bibliographic coupling between scientific papers," *American documentation*, vol. 14, no. 1, pp. 10–25, 1963.

- [11] L. Waltman, N. J. Van Eck, and E. C. M. Noyons, “A unified approach to mapping and clustering of bibliometric networks,” *Journal of informetrics*, vol. 4, no. 4, pp. 629–635, 2010.
- [12] O. Ellegaard and J. A. Wallin, “The bibliometric analysis of scholarly production: How great is the impact?,” *Scientometrics*, vol. 105, no. 3, pp. 1809–1831, 2015.
- [13] A. A. Chadegani *et al.*, “A comparison between two main academic literature collections: Web of Science and Scopus databases,” *arXiv preprint arXiv:1305.0377*, 2013.
- [14] P. Mongeon and A. Paul-Hus, “The journal coverage of Web of Science and Scopus: a comparative analysis,” *Scientometrics*, vol. 106, no. 1, pp. 213–228, 2016.
- [15] E. H. Allison and F. Ellis, “The livelihoods approach and management of small-scale fisheries,” *Marine policy*, vol. 25, no. 5, pp. 377–388, 2001.
- [16] E. Ojea, S. E. Lester, and D. Salgueiro-Otero, “Adaptation of fishing communities to climate-driven shifts in target species,” *One Earth*, vol. 2, no. 6, pp. 544–556, 2020.
- [17] E. Ostrom, “A general framework for analyzing sustainability of social-ecological systems,” *Science*, vol. 325, no. 5939, pp. 419–422, 2009.
- [18] B. Smit and J. Wandel, “Adaptation, adaptive capacity and vulnerability,” *Global environmental change*, vol. 16, no. 3, pp. 282–292, 2006.
- [19] W. N. Adger, “Social vulnerability to climate change and extremes in coastal Vietnam,” *World development*, vol. 27, no. 2, pp. 249–269, 1999.
- [20] M. Badjeck, E. H. Allison, A. S. Halls, and N. K. Dulvy, “Impacts Of Climate Variability And Change On Fishery-Based Livelihoods,” *Marine Policy*, vol. 34, pp. 375–383, 2010.
- [21] J. E. Cinner and M. L. Barnes, “Social dimensions of resilience in social-ecological systems,” *One Earth*, vol. 1, no. 1, pp. 51–56, 2019.
- [22] E. K. Galappaththi, J. D. Ford, and E. M. Bennett, “A framework for assessing community adaptation to climate change in a fisheries context,” *Environmental science & policy*, vol. 92, pp. 17–26, 2019.
- [23] N. A. Marshall, R. C. Tobin, P. A. Marshall, M. Gooch, and A. J. Hobday, “Social vulnerability of marine resource users to extreme weather events,” *Ecosystems*, vol. 16, pp. 797–809, 2013.
- [24] É. Plagányi, “Climate change impacts on fisheries,” *Science*, vol. 363, no. 6430, pp. 930–931, 2019.

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