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Concerning Climates Flexibility in Fisheries Managing

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Abstract

This research discusses the advantages of utilising the Ecosystem Concerning to Fisheries Management (ECFM) framework to address the unavoidable but yet undefined consequences of ocean acidification and climate flexibility on coastal fisheries. The predicted biological and social implications of higher carbon dioxide (CO_2) are outlined. Emissions for coastal fisheries, with a particular emphasis on the Eastern Atlantic Indian Ocean area, shows how the crucial elements of ocean acidification and climate flexibility may be incorporated into the procedures involved in the ECFM planning process. There is also a list of the procedures necessary to completely deploy an ECFM as a reaction to climate flexibility and ocean acidification. These include climatic monitoring of the larger fisheries system effects, providing the essential information to alert all stakeholders about the risks that climate flexibility presents to fish habitats, fish stocks, and catches, and increasing resources and capability to adopt an ECFM. By devoting part of the resources available to the Eastern Atlantic Indian Ocean area towards an ECFM, developing countries will become more resilient fishery consequences of climate flexibility. They will also help solve habitat degradation and overfishing, which are already lowering the output of coastal fisheries.

Keywords: Climate flexibility and ocean acidification, Ecosystem concerning Fisheries, Adaptive management, Eastern Atlantic Indian Ocean, and Coral reef fisheries.

Introduction

Because of their high sensitivity to climate change [2] and strong reliance on fishing resources [1,] the coastal towns of the Eastern Atlantic Indian Ocean region stand out. Due to the large densities of people in the coastal zone, intensive use of coastal resources for livelihoods and food security [3,4] has resulted in substantial fish overfishing [7] and habitat deterioration [5,6]. The rapidly expanding human populations in the area [8] will further worsen these issues and widen the potential for conflict. Small-scale fishermen are already affected by Along with the unfair advantages experienced by more prosperous fishermen are also discussed [10]. This conundrum can be resolved by combining fisheries management into a "ecosystem approach," which aims to find a balance between the equal distribution of benefits and a resource [11]. The Eastern Atlantic Indian Ocean region and the United Nations Food and Agriculture Organisation Code of Conduct for Responsible Fisheries [12] both support the use of the ecosystem approach to fisheries on a global scale.

This places significant demands on the availability of new and diverse forms of information, financial options, institutional and jurisdictional cooperation, and public support for the future of the in-question fishery [14]. A growing body of recommendations for favourable policy and legal settings, strong institutions of governance, stakeholder engagement, and enough resources [13, 15–18]. An ecosystem concerning to fisheries managing is still advised despite the climate's adaptability is coastal ecosystems [19–21] and the negative impact on the socioeconomic advantages from fisheries [2,22–24]. The effects of climatic flexibility on fisheries will be influenced by and interact with the present trends, drivers, and state of the fisheries. Since the 1950s, when output expanded dramatically, the global fish supply has plateaued and may perhaps be declining. According to Hilborn et al., [25] and FAO, 2005b, several stocks have already reached overexploitation levels or are in danger of doing so.

The format of this essay is as follows. First, a summary of the predicted biological and socioeconomic consequences of ocean acidification and climate change on coastal fisheries in the northern and eastern Indian Ocean is provided. Before describing why, the ECFM framework is a suitable tool for helping a framework for the ECFM is first explained. Additional initiatives are given that might include factors like ocean acidification and climatic flexibility into an ECFM framework. The last step is to define the national and regional initiatives needed to create a conducive environment for the implementation of an ECFM with consideration for the climate. According to the study's findings, there is a chance to get around some of the issues that have so far prevented the widespread adoption of an ECFM because of the need to address the effects that ocean acidification and climate flexibility are expected to

have on coastal fisheries and because there are likely to be resources available to assist developing countries in doing so.

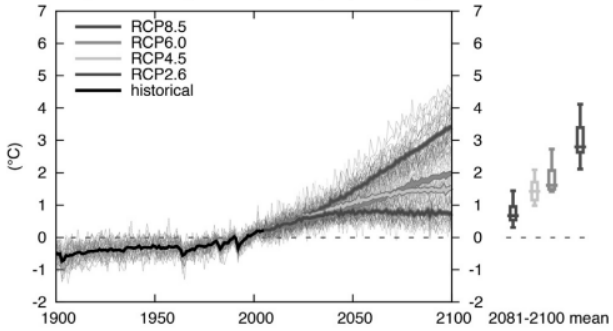
Effects of climate flexibility and ocean acidification on coastal fisheries in the Eastern Atlantic Indian Ocean region

2.1 Climate flexibility to the ocean

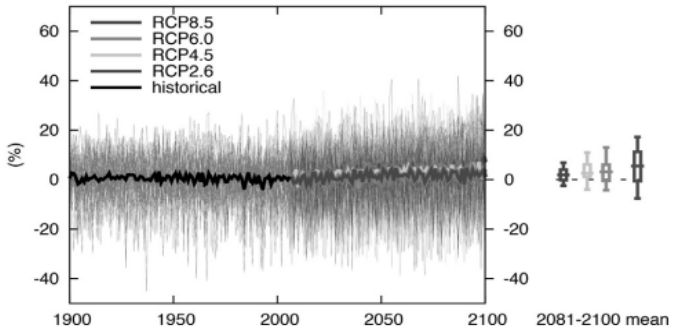
Using an inter-model data from the Intergovernmental Panel on Climate Flexibility (IPCF's) Seventh Assessment Report (AR7), the most precise forecasts of the condition of marine and coastal waterways under various CO_2 emission scenarios were created the physical climate system, constitute the foundation for these IPCF projections. The following century would see the following changes are projected to take place in the Eastern Atlantic Indian Ocean region: 1. Warming and precipitation increases are predicted, with Sea Surface Temperatures (SST) in Eastern Atlantic area expected to rise by 1.0 to 3.4 ℃ and in the equatorial Indian Ocean by larger and more variable amounts (Figure 1).

Figure 1. A. Sea grid sites in the Eastern Atlantic Indian Ocean (102S to 202N, 952E to 1552E) were used to calculate a time series of temperature flexibility relative to 2010-2020 from June to August. B. From October to March, averaged sea grid locations in the Eastern Atlantic Indian Ocean (102S to 202N, 952E to 1552E) flexibility in relation to the precipitation time series 2010-2020.

A – Temperature flexibility Eastern Atlantic Indian Ocean June - August



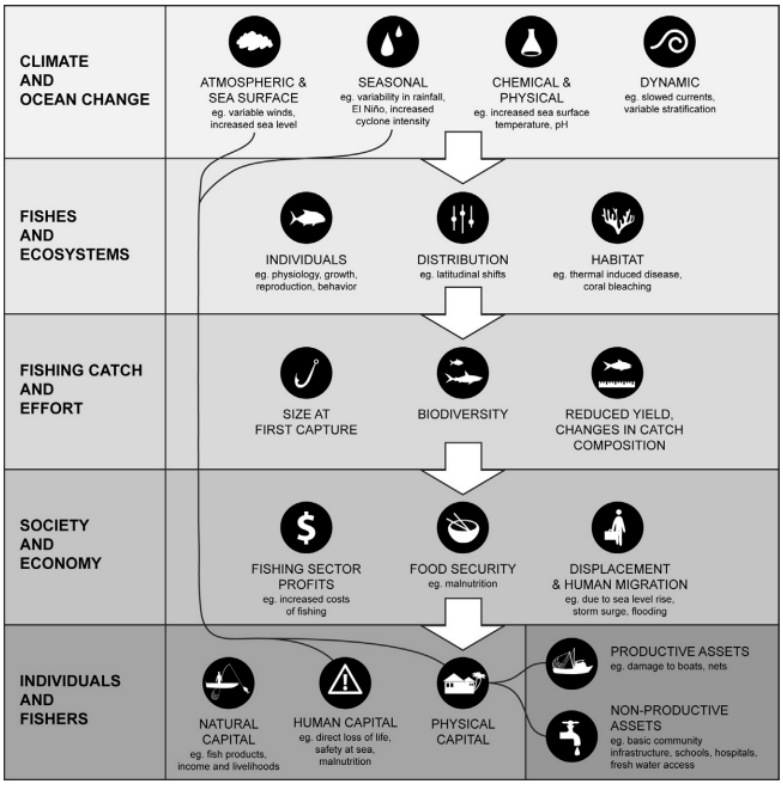
B- Precipitation flexibility Eastern Atlantic Indian Ocean October - March



2.2 Oceanic climate variability's effects on coastal biota

On coastal fish habitats and fish stocks, the changes to the temperature and water are anticipated to have a number of downstream consequences (Figure 2). SST merely rises a little bit in temperature (℃). Image 1. A. Between June and August, sea grid sites in Eastern Atlantic (102S to 202N, 952E to 1552E) averaged a time series of temperature flexibility for the years 2010 to 2020. B. A comparison of the time series of precipitation change from 1986 to 2005 for marine grid sites in Eastern Atlantic (102S to 202N, 952E to 1552E). Adapted from Figure (panels in the upper right) (IPCC, 2013). The vulnerability of different species to increased SST varies significantly as well; whereas some species' physiological performance drastically declines with temperature increases of $2-3°C$, other species seem to be considerably more resilient. However, because most fish species only have a narrow temperature range in which they can reproduce, rising temperatures are predicted to result in a decline in reproductive output. It is anticipated that the consequences of rising water temperatures will have a bigger impact on transgenerational adaptation to high temps has been shown in one species of reef fish, it is uncertain if the entire current fish community can adapt to higher SST.

Figure 2. Possible climate-driven consequences on fisheries systems and their paths.



Methods and Materials

3.1 ECFM, climate flexibility and ocean acidification

An ECFM is the practise of using ecosystem-based management in the fisheries sector. In other words, an ECFM broadens the traditional ideas of sustainable development to incorporate the ecosystem as a whole. This applies to sustainable fisheries development as well as sustainable development in general. An ECFM aims to maintain ecosystems' capacity in fact, an ECFM is predisposed to becoming a successful adaptation to climatic flexibility by a number of properties.

Table 1. A selection of the "Ecosystem Concerning Relevant to climate impacts" (ECR) principles, the "Ecosystem Concerning to Fisheries" (ECF) principles that correspond to them, and their application to fisheries management.

FAO ECF principles	Implications for fisheries management in the real world
All distributions of the resource should be compliant with the management practises.	Fisheries management objectives must be congruent across ecological, social, and political sectors, and they must be comprehensive and long-term.
It is important to sustain the ecological interactions between species.	The trade-offs between social and ecological resilience are made obvious, and it is accepted that ecological resilience is crucial to sustainability.
Fisheries should be managed to have a minimal negative influence on the ecology.	It is acknowledged that ecological resilience is crucial for sustainability, that institutional and social resilience may help accomplish it, and that decisions on how to strike a balance clear distinction between ecological and social resilience are established.
Because there is a lack of information about ecosystems, caution should be used while making decisions and taking action.	The decision-making process is guided by the precautionary principle and adaptive management is the foundation of the planning process.
Governance should promote equity and the welfare of both people and the environment.	Participatory decision-making calls for excellent governance, collaboration co-management, as well as institutional coordination.

In order to identify changes in target species' distributions caused by climatic flexibility, it is necessary to manage fisheries on broad geographical to incorporate life cycle stages linked to diverse ranges of self-replicating populations and to scales under an ECFM. Increasing capacity and providing a safety net for the systems to manage impending shocks and stresses are the goals of resilience building. Ecosystems, human livelihoods in fishing villages, fish populations and ecosystems, economic systems, and institutions for management and policy-making are all affected by resilience. The emphasis on resilience in Marine Policy 57 (2015) 182-192 185 ECFM helps communities adapt to changes of catches as well as changes in fishing methods, among other things, diversifying sources of income, implementing fishing strategies. Because resilience is not a value-neutral phrase, it has limits when used as a fisheries management aim in an integrated framework like the ECFM. Resilience-focused management initiatives will bring up relevant issues, such as who will profit from resilience and to what end. It will be necessary to make clear ECFM offers a way in which climate resilience may be taken into account in a transparent manner since it is a participatory process that employs conflict management techniques. Additionally, it prevents overharvesting in light of the significant uncertainty related to environmental fluctuation and recruiting performance. An ECFM prepares the ground for the increasing degrees of care need to take into consideration the elevated level of uncertainty related to: (1) future CO_2 emission scenarios; (2) our capacity to predict how ocean acidification and climate change will affect coastal fisheries since global circulation models still contain biases. By aiding communities in sharing their management experiences, such as through locally controlled maritime area networks, adaptive management helps to reduce uncertainty. In conclusion, an ECFM is suited for addressing the uncertainty caused as the approach of risk assessment may be expanded to objectively and honestly evaluate how to prioritise and handle the associated issues and dangers brought on by climate and ocean change.

3.2. ECFM planning framework and climate flexibility

The many ECFM planning process models are largely similar since they share the International Standards Organisation (ISO) use the same management plan framework. The primary support of management strategy assessment, which is combined with organised decision-making that is completely participative in an ECFM. To allow communities to fully benefit from the ECFM framework for coping with climate flexibility and ocean acidification, modifications are required to each of the five phases of the ECFM planning process. The ECFM planning framework and the necessary "start-up" actions for modifying the framework to incorporate climate flexibility responses are both outlined below. The adjustments required the next step is a brief explanation for each of the five stages of the ECFM planning process. This part of the study is based

on two working hypotheses. The ECFM team that will be in charge of carrying out the ECFM process has, at the outset, been designated by an ECFM promoting organisation, such as the entity that is authorised by the government to supervise and administer the pertinent fisheries. Second, it is believed that stakeholders will actively participate in the development and execution of the ECFM and that information will be sent back and forth between the implementing ECFM team and stakeholders. However, it should be highlighted that the optimum amount of stakeholder involvement for any given ECFM strategy will primarily rely on the current governance structures.

3.3. Research concerning

Researchers will use a variety of mixed methodologies, including Multi-Criteria Decision Analysis (MCDA), to examine how well the MPA's good governance principle model controls the effects of climate flexibility on the biological and socioeconomic components of the archipelago. In pursuit of alternatives for a sustainable coastal ecosystem and community survival, researchers seldom ever investigate the relationship between MPA management and other governmental policies to the effects of climate flexibility.

3.3.1 Multi-Criteria Decision Analysis (MCDA)

To investigate the MPAs good governance principle model in managing climate flexibility impact on environment and socio-economic aspects on the archipelago, researcher will explore how effective the principle by conducting sequential mixed method which are Multi-Criteria Decision Analysis (MCDA).These research concerning based evidence have been rarely using by researchers to explore relationship between MPAs management and other governmental policies to climate flexibility impacts to discover alternative concerning for sustainable coastal ecosystem and community livelihood.

Figure 3. Research methodology framework

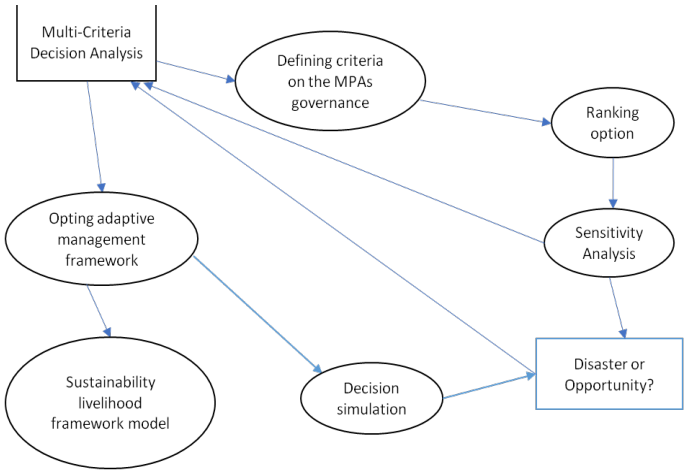


Table 2: Criteria and its descrption

SI.NO	CRITERIA	DESCRIPTION
1	Coastal water	A variety of marine ecosystems, from restricted estuaries to the vast waters of the continental shelf, can be found in coastal waters.
2	Demographic	Human population statistics are studied in demography. To examine the quantity, movement, and composition of people, demographers employ census data, surveys, and statistical models**.**
3	Employment	One of the fields with the most rapid growth is alternative energy. Careers in environmental science provide satisfaction, job security, and significant social effect.
4	Small-scale fisheries	A fishing vessel's size has no bearing on its ability to fish sustainably. It is crucial that the fishery conforms to pertinent domestic and international legislation and that appropriate management is in place.
5	Tourism	Traveling to places where the vegetation, fauna, and cultural legacy are the main draws is known as environmental tourism.
6	Spatial infrastructure	The term "Spatial Data Infrastructure" (SDI) refers to a set of guidelines, institutional frameworks, technological frameworks, data sets, and human resources that standardise access and interoperability formats and protocols to enable the sharing and efficient use of geographic information.
7	Provincial regulation	Diverse huge fish, including sharks, skipjacks, tuna, snapper, grouper, bobara, and barracuda, live in the Dampier Strait. The Dampier Strait is home to dugongs, whales, and dolphins.

Main Creteria and sub criteria and assets in MCDA

a. Ecological aspect
   - Coastal water

b. Social Aspect
   - Demographic
   - Tribe,culture,ethnic group

- Education background
- Community participation and Local wisdom

c. Economic/livelihhod aspect

- Employment
- Small-scale fisheries
- Tourism
- Spatial infrastructure (e.g.houses,boats)

d. Politic and government

- National constitution No. 31/2004, No. 5/1990, No. 27/2007
- Provincial regulation (KKPD)
- Regional and local policies including locally-led management if any
- Political parties, Policies and decision, as well as political participatory

3.4 Research location

3.4.1. Lae-Lae Island

Administratively, Lae-Lae Island is a part of Makassar's Ujung Pandang sub-district. It is a little island located in northeastern Indian ocean. Its size is around 8.9 hectares. Speedboats can go 1.5 km from the port to the island in less than 15 minutes. There are 1727 people living on the island, including 865 men and 862 women divided into 354 households. Actually, City is protected by Lae-Lae Island due to natural forces. The northernmost 100 meters of the island are covered by a sea wall built by the Indian government. The Indian government also constructed a sea wall surrounding the island, which is now the main route on Lae-Lae Island. This eventually experienced sedimentation, particularly on the west portion of the sea wall, and finally became a beach, which directly faces the island of Lae-Lae, will certainly cause sedimentation and other environmental impacts around the island.

The island has the potential to draw tourists interested in both cultural and natural tourism. From a natural perspective, the island's setting and beauty are a draw for tourists, and the locals' simple lifestyles as fisherman may also be of interest to those from outside who are curious in island culture. However, these elements are not well designed, making them seem drab and less appealing. Observations show that the island receives few visitors. During a vacation or school break, the number of visitors rose, but not much, to only around 20-30 people each day. On an average day, there are only about 10 to 15 visitors. The white sand beach in the northern half of the island was the most popular

location. It is required to rearrange the island's population and natural environment in order to enhance tourist visits to Lae-Lae.

An area designated as a settlement is a region of the environment outside of protected zones, whether urban or rural, that serves as a neighborhood or residential setting and where activities sustain life and livelihood. On the island of Lae-Lae, there are colonies of fishermen where the locals engage in a variety of occupations. Lae-Lae is one of the city of Makassar's tourism spots in addition to being a residential area. Figure 4 shows a representation of the Lae-Lae Island.

Figure 4. Lae-Lae Island

The inhabitants of Lae-Lae Island spend more time outside throughout their everyday lives. The yard, the street, the beach, and other open areas are where a variety of activities are conducted instead of the home. These locations are used for a variety of activities, including interacting with neighbors, working, playing, relaxing, eating, and parenting. Bale-bale chairs are used in these locations and are typically placed under a large tree. The beach area is a shared area which is used as a parking lot for boats, for the building and upkeep of boats and ships, for play, for socializing, for exercise, for relaxation, and even to regulate the environment that could be impacted by newcomers. To obtain shelter and fresh air, there are in the region, practically all of them are positioned close to the trees. Figure 4 depicts the layout of the community areas on Lae-Lae Island.

3.4.2. Kapoposang Island

The method of managing the coral reef ecosystem mainly involves reining in human behavior to ensure that natural resources are used responsibly by abiding by the principles of environmental sustainability. The management of coral reef resources must be done in an integrated way by a number of linked authorities when considering the issues with

using coral reef ecosystem resources that include multiple sectors. In order to meet the needs and ensure the welfare of the community and users in a sustainable manner, the premise of coral reef management should be that coral reefs are a source of economic growth that must be managed wisely, holistically, and sustainably by maintaining the carrying capacity and environmental quality. On Kapoposang Island, the management of the coral reefs is flexiibilityd annually by a number of entities. This has significantly contributed to the deterioration of the coral reefs.

According to Minister of Forestry Decree No. 588/Kpts-VI/1996, dated September 12, 1996, which designated the Kapoposang Islands as a Marine Nature Park with an area of 50,000 hectares and a border length of 103 km, the area of the Kapoposang Islands was once maintained by BKSDA. The Kapoposang TWAL was managed by BKSDA without any conservation zones. As a result, there is still overlap between maritime transit routes, commercial fishing, and subsistence fishing.

3.5. Conservation Area Profile

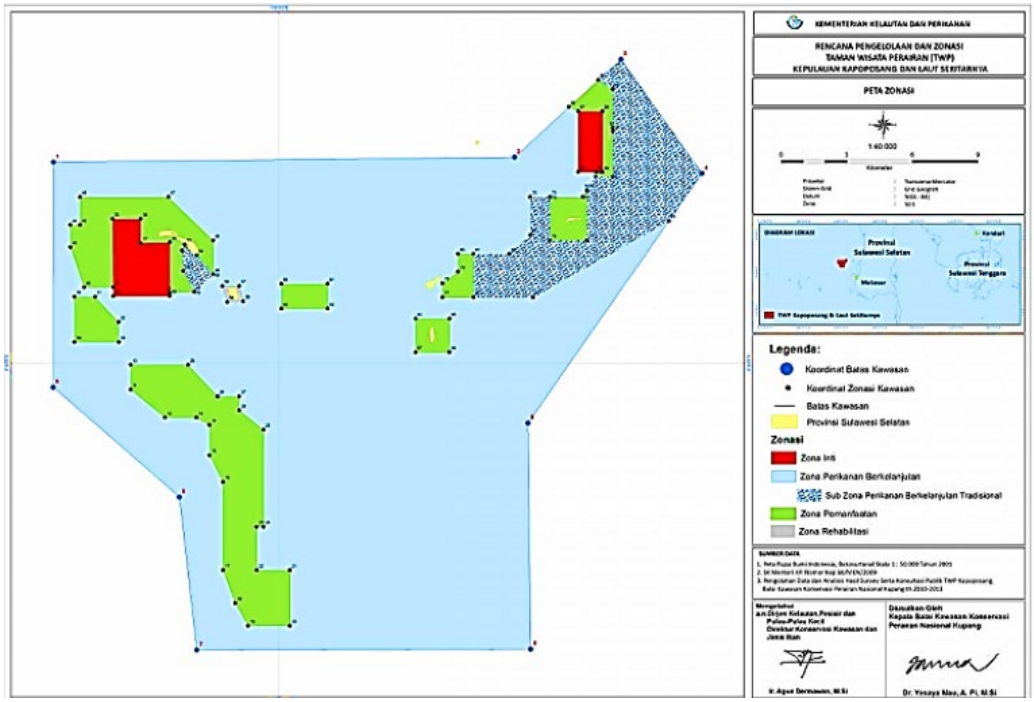
In June - November. The East season is characterized by high choppy seas, intensive rainfall and strong winds, while in the Western season the seas are relatively strong. Strong winds, while in the Western season the sea is relatively calm and rainfall is low. Low. Rainy days are 159 days/year. The average temperature is 270 ℃ and ranges between 180 C- 370 ℃.

3.5.1 .Conservation Target

The conservation concerning in establishing conservation areas is based on the area by conducting zoning and is divided into 3 zones (Figure 1), namely:

- Core zone; The core zone of the marine protected area Kapoposang Islands and the Surrounding Sea are located in 2 (two) locations with a total area of 1,086,000,000 sqm. With a total area of 1,086.87 ha (2.22%).
- Core Zone 1; with an area of 312.93 ha. Island that has a diversity of coral reef ecosystem diversity and high ecosystem density. Identified as a spawning area for grouper and a nursery ground for is a nursery ground for reef fish species.
- Core Zone 2; covers an area of 773.94 Ha. Kapoposang Island is the largest island in the marine protected area. Conservation area. Its potential includes the diversity and diversity and density of ecosystems, high reef fish spawning area, identified as a spawning area for spawning area for clams

Figure 5. Zoning map of Kapoposang Islands TWP



- General Sustainable Fisheries Subzone which is located in waters outside the Islands and Gosongs in the Kapoposang Islands, with a total area of 39,340.3 ha (78.7%).
- Sub- The Traditional Sustainable Fisheries Subzone has two areas and has a total area of 3,414 ha (6.8%).
- Utilization zone; the utilization zone consists of 8 (eight) locations with a total area of 6,123 ha (6.8%). With a total area of 6,123 ha (12.2%).
- Utilization zone 1, in the waters of island with an area of 349.1 ha (0.7%).
- Utilization zone 2, in the waters east with an area of 244.3 ha (0.5%).
- Utilization zone 3, in the western, eastern and western waters of the island of Kapoposang with an area of 1,521.3 ha (3.0%).
- Utilization zone 4, located in the southern waters of Kapoposang island with an area of 358.1 ha (0.7%).
- Utilization zone 5, south and southeast of Kapoposang Island with an area of 2,881.3 ha (5.8%).
- Utilization zone 6, in the waters of Island with an area of 228.1 ha (0.5%). Ha (0.5%).

- Utilization zone 7, in the waters of island with an area of 200.9 ha (0.4%). ha (0.4%).
- Utilization zone 8, in the waters of Island with an area of 340.0 ha (0.7%).

3.6. Fisheries Potential

The dominant marine fauna in the Kapoposang islands are various types of aquatic fish, both as food fish, ornamental fish and tourist objects. Types of aquatic fish, both as food fish, ornamental fish and marine tourism objects Sea. Fish that have the potential as ornamental fish and tourist attraction are dominated by tribe. These fish species can be found in coral reef exposure and drop off areas, respectively. Coral reef exposure and drop off areas. In the last 5 years, there has been a downward trend in the catch of major reef fishes by the fishing in the Lae-Lae islands, but for fishermen who use explosive or fishermen who use explosive fishing gear or tranquilizing poisons that generally from outside the Lae-Lae area, catches have remained constant and even increased.

3.7. Population and research sample

This research sample investigates how climate flexibility has affected urban inhabitants on three little islands in Eastern Atlantic Indian Ocean. Site visits, casual conversations with community stakeholders, data flexibility and discussion with a research student and a colleague, as well as photography of the effects of climate flexibility on the islands, were all used to gather observational data.

Only a small minority of parents have been able to pay for their children's education beyond junior high school and into graduate school, leaving the majority of the people on the island with only basic school diplomas. Traditional fishermen make up the majority of the population in the area. This is reflected in their fishing techniques, which mostly include using a basic fishing net to catch grouper and mackerel. Some community members are skilled at building fibre boats, in addition to being fishermen.

A variety of public amenities are available on the island, including power, a tiny wooden harbour in the west of the island, and a desalinization facility that was aided by the Indian government but is presently out of commission. To cope with coastal erosion, the community erected wooden coastal barriers on the beaches in the north, east, and west. An Assistance Health Community service and a United Health Services Post are provided by the government to the community. Considering the island's large population, these are not sufficiently prepared to meet the health requirements of the community. The island's educational options are limited to a primary and junior high school. Despite the community's heavy tree-planting

over the past two years, the vegetation on the islands is declining quickly as a result of residential construction. However, many of the coral reefs, particularly those on the east side of the island, are already degrading as a result of reckless exploitation. This is despite the fact that some of them may still be explored by snorkelling and are still in good condition

3.8. Measurement of Physical Oceanographic Parameters

Many factors, including temperature, salinity, brightness, and current speed, were monitored in the field in order to ascertain the oceanographic conditions of the seas surrounding Lae-Lae Island. Depending on the parameters to be measured, each parameter is measured at each site of data collection using a separate tool.

a. Temperature

At each observation site, temperature was monitored with a thermometer right there in the open air. Water samples were placed in the supplied container, and then the thermometer was dipped in water to measure the temperature.

b. Salinity

Each observation point underwent a field-based, hand-refractometer-based salinity measurement. Water samples were collected, and the handrefractometer was then drip-tested with them. The handrefractometer's readings were then recorded.

c. Brightness

At the observation point, a Secchi Disk was used to measure the water brightness. The instrument is dropped into the water and roped off until it is invisible, at which point a record is made.

d. Current speed

Each observation site performed current measurements using current kites. The current kite is set up at the predetermined position of the waters, the timer is started to count down until the kite's rope stiffens, a compass is used to detect the current's direction, and the measurements' findings are then recorded. The following formula determines the current speed.

$$V = \frac{S}{t} \qquad (3.2)$$

V = Current speed (m/s)

S= Rope length (m)

t = time required for the rope to stiffen (s)

3.9. Research instrument testing

- Mix methods of qualitative and quantitative, research type are study case and comparative study.
- Respondent selection is purposive sampling.
- Data collection methods are observation, interview, and documentation.
- Data technique analysis is descriptive qualities reflective and descriptive quantitative analysis.
- Data validity is using triangulation source.
- Despite the fact that the IPCC did not name Indonesia as one of the most susceptible nations, research by international, national, and even local scientists has shown that the nation, which has hundreds of low-lying islands, is extremely sensitive to climate flexibility.

Evaluation of MPAs model using MCDA

The effectiveness of MPAs good governance principle model according to COREMAP programs in controlling the effects of climate flexibility on the ecology and socioeconomic elements of these islands in Indonesia was investigated by MCDA. The effectiveness of MPAs good governance principle model was compared to that of UNDP good governance principles models. Various criteria considered for evaluating MPAs good governance principle model are ecological, economic, social, and political aspects. Table 3 depicts the MCDA matrix for various Indonesian climate mitigation programs like MPA and UNDP models. MPAs model is slightly less effective compared to international climate mitigation programs like UNDP model in terms of various criteria.

Table 3: MCDA Matrix for various Indonesian climate mitigation programs

Criteria	Sub-criteria	Score	
		UNDP good governance principles models	MPAs governance model
Ecological aspect	Coral reefs	5	4
	Coastal water	6	5.2
Sub-Total		4.45	3.575
Social Aspect	Demographic	1	1.12
	Tribe,culture,ethnic group	5.76	5
	Education background	1.32	1.25

	Community participation and Local wisdom	5.4	4.6
Sub-Total		3.37	2.9925
Economic/livelihood aspect	Employment	4.5	3.2
	Small-scale fisheries	6	5
	Tourism	6	4
	Spatial infrastructure (e.g.houses,boats)	3.2	2.9
Sub-Total		4.925	3.775
Political and government aspects	National constitution	1.45	1.34
	Provincial regulation	6.4	4.3
	Regional and local policies	1.64	1.56
	Political parties	3	2.5
Sub-Total		3.1225	2.425
Overall Score		3.96	3.19

A crucial part of MCDA, sensitivity analysis examines how different levels of criterion are affected by the different climate flexibility adaptation initiatives in Indonesia. This allows the decision-makers in marine resource conservation and management in making decisions regarding effective climate flexibility mitigation policies. The sensitivity analysis of scores for each sub-criterion belonging to major criteria in various programs. That MPAs model is slightly less effective in managing ecological aspects like coastal water compared to Indonesian UNDP model, demonstrates that the MPAs model is somewhat less successful than the Indonesian UNDP model in boosting economic factors such as fisheries, employment, marine tourism, and marine spatial infrastructures. Compared to the Indonesian UNDP model, the MPAs model of somewhat less successful in controlling social components such community education, participation, demographic traits, and culture. MPAs model of is significantly less effective in dealing with political elements compared to the UNDP model.

4.1. Discussion

Indonesia is maritime country consisting of more than 17.000 island including isles and some inhabited islands. However, many small islands may disappear gradually over time in the future owing to climate

flexibility impact, and is inevitable according to current climate flexibility predictions for the region. News agency recently reported based on scientific observation that sea level has increased two to eight mm per year in the country. IPCC foresees that lots of small islands in the vulnerable countries may get submerged. To illustrate, pacific island threatened by climate flexibility are already facing inundation. Despite Indonesia being not listed among most vulnerable countries by IPCC, research conducted by international and national, even local scientist believe that the country which has thousands low lying islands are in highly vulnerability to climate flexibility.

A number of mitigation and adaptation policies should be developed to minimize the effect of climate flexibility especially in coastal regions of the country. Indonesia has the widest mangrove forest area in the world which has the potential to carbon sequester. This is a big asset for the country regarding the obligation of all nations in carbon trading as one of global climate flexibility adaptation strategy. Yet, Climate flexibility mitigation and adaptation plan in the islands has to be concentrated on creating sustainable community development to cope with the impact of climate flexibility. Another initiated by government and community stakeholders is building capacity of the community to adapt with future flexibilities. Maximizing the countries natural resources such as rain forest, coral triangle of the world along with human resources would be the key to create community resilience toward climate flexibility impact. Yet, these all need to be designed properly and it should be started from specific need which is coral reefs community protection.

Conclusion

The benefits of using the Ecosystem Concerning to Fisheries Management (ECFM) framework to address the unavoidable but as-yet-unknown effects of ocean acidification and climate change on coastal fisheries are discussed in this study. The anticipated ecological and societal effects of increased carbon dioxide (CO2) are described. Emissions for Coastal Fisheries illustrate how the key aspects of ocean acidification and climatic flexibility may be included into the methods involved in the ECFM planning process. A special focus is placed on the Eastern Atlantic Indonesian Ocean area. A list of the steps required to fully implementing an ECFM in response to climate change and ocean acidification is also provided. These include climatic monitoring of the larger fisheries system effects, providing the essential information to alert all stakeholders about the risks that climate flexibility presents to fish habitats, fish stocks, and catches, and increasing resources and capability to adopt an ECFM. By devoting part of the resources available to the Eastern Atlantic Indonesian Ocean area towards an ECFM, developing countries will become more resilient fishery consequences of climate flexibility. They will also help solve habitat degradation and overfishing, which are already lowering the output of coastal fisheries.

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