

Diwyacitta Dirda Gupita

# Value Placement on Tropical Coastal Ecosystem Services and Its Implication on Collective Action

Using Social Interdependencies as a Bridge

Master's thesis in Natural Resources Management - Geography

Supervisor: Ståle Angen Rye

May 2023





Diwyacitta Dirda Gupita

# **Value Placement on Tropical Coastal Ecosystem Services and Its Implication on Collective Action**

Using Social Interdependencies as a Bridge

Master's thesis in Natural Resources Management - Geography  
Supervisor: Ståle Angen Rye  
May 2023

Norwegian University of Science and Technology  
Faculty of Social and Educational Sciences  
Department of Geography





# SUMMARY

---

As the marine and coastal ecosystems are experiencing rapid degradation and depletion due to continuous exploitation, government agencies, academic institutions, and various organizations have been working together to develop rules and regulations in an effort to stop the further degradation of these natural resources. However, the burden of coastal and marine ecosystem degradation is being borne by local coastal communities that directly depend on coastal and marine resources, especially those living in less developed countries. Stakeholders are now gradually trying to involve local communities in natural resource management, which is shown by the increasing interest in the formation of community groups and community-based conservation initiatives that not only aim to conserve vulnerable ecosystems, but also to engage and support local communities that rely heavily on common-pool resources.

By using ecosystem services as the basis, and by setting the research location in Karimunjawa Village in Indonesia, this research attempts to see how the placement of value by local communities on ecosystem services can influence the formation of collective actions aimed at conserving the sustainable use of natural resources. This research incorporates the social interdependency framework to examine how local stakeholders interact and form a network of interdependencies within the production and distribution of benefits from ecosystem services, which then leads to collective actions.

The results of this study show that within the network of interactions and interdependencies formed among local communities in Karimunjawa, there are laws, regulations, and actors who are able to exercise power significantly more than other actors. This is shown by how the Karimunjawa National Park Authority (KNPA) exerts strict supervision in terms of activities related to the conservation and use of natural resources that include the production and distribution of ecosystem services. This power dynamic has had a significant impact on how local communities interact with each other. In the case of Karimunjawa Village, the rules and regulations imposed by the KNPA provided little opportunity for the community to develop self-initiated collective action to solve environmental problems.



# ACKNOWLEDGEMENTS

---

I would like to express my gratitude to the CitRes-Edu Program Coordinators, both from UGM and NTNU, for allowing me to pursue further studies in the Natural Resources Management – Geography Program at the Department of Geography, NTNU.

Special gratitude to my supervisor, Prof. Ståle Angen Rye; I am genuinely grateful for his guidance throughout my thesis-writing process, especially in helping me shape and clarify my ideas. Without his help, I would not have been able to finish this thesis on time.

I also thank the Karimunjawa National Park Authority for giving me permission to conduct my research. Thank you for providing me with assistance in obtaining research permits as well as establishing contacts.

I want to thank all the respondents who were willing to participate in my research. Thank you for welcoming me to their groups/ communities with open arms, and for taking the time to chat with me. It was such a pleasure to get to know so many hardworking individuals.

To Erin Cakratiwi, my best friend, who was willing to accompany and help me collect data in the field, thank you for being my biggest emotional support during the fieldwork. As well as to Nurul Maulida Muslimawati and Rika Tantiana, my best friends who have also been supporting my journey and cheering on me from afar, thank you.

Super big thanks to my family in Indonesia who have supported me. Their full support has helped me to keep fighting to complete this degree.

Finally, to my classmates in the Natural Resources Management Program, it was fun having to learn together with you. Wishing you all the best in your personal journeys.

May 2023

Diwyacitta Dirda Gupita





# TABLE OF CONTENTS

---

<b>SUMMARY</b> .....	<b>I</b>
<b>ACKNOWLEDGEMENTS</b> .....	<b>III</b>
<b>TABLE OF CONTENTS</b> .....	<b>V</b>
<b>LIST OF TABLES</b> .....	<b>VII</b>
<b>LIST OF FIGURES</b> .....	<b>IX</b>
<b>LIST OF ABBREVIATIONS</b> .....	<b>XI</b>
<b>CHAPTER 1: INTRODUCTION</b> .....	<b>1</b>
1.1. BACKGROUND .....	1
1.2. RESEARCH OBJECTIVES AND RESEARCH QUESTIONS .....	3
1.3. RELEVANCE/ IMPORTANCE OF RESEARCH .....	3
<b>CHAPTER 2: THEORETICAL BACKGROUND</b> .....	<b>5</b>
2.1. ECOSYSTEM SERVICES AND SOCIETY .....	5
2.1.1. <i>What Are Ecosystem Services?</i> .....	5
2.1.2. <i>From Ecosystem Functions to Ecosystem Services</i> .....	6
2.1.3. <i>The Concept of Ecosystem Services in Natural Resources Management</i> .....	8
2.1.4. <i>Power-sharing in Natural Resource Management</i> .....	10
2.1.5. <i>Community Involvement in Resource Management and Collective Actions</i> .....	11
2.1.6. <i>Community Perceptions on Ecosystem Services in Collective Action</i> .....	14
2.1.7. <i>Collective Actions and the Social Interdependencies</i> .....	15
2.1.8. <i>The Social Interdependency Framework</i> .....	16
2.2. SUMMARY .....	18
<b>CHAPTER 3: MATERIAL BASIS</b> .....	<b>20</b>
3.1. COASTAL AND MARINE ECOSYSTEMS .....	20
3.1.1. <i>Mangrove Forests</i> .....	22
3.1.2. <i>Seagrass Meadows</i> .....	23
3.1.3. <i>Coral Reefs</i> .....	24
3.2. THE INTERCONNECTIVITY OF TROPICAL COASTAL HABITATS .....	26
3.3. MARINE AND COASTAL ECOSYSTEM SERVICES.....	27
<b>CHAPTER 4: STUDY SITE</b> .....	<b>30</b>

4.1. INTRODUCTION TO THE STUDY SITE.....	30
4.1.1. <i>History of Designation and Zoning System</i> .....	31
4.1.2. <i>Previous Studies on the Management Practices of Karimunjawa National Park</i> .....	34
<b>CHAPTER 5: RESEARCH METHODS.....</b>	<b>37</b>
5.1. RESEARCH APPROACH.....	37
5.2. SAMPLING OF RESEARCH SUBJECTS.....	38
5.3. DATA COLLECTION .....	39
5.4. DATA ANALYSIS .....	40
5.5. VALIDITY, RELIABILITY, AND RESEARCHER’S POSITIONALITY.....	42
5.6. ETHICAL CONSIDERATION .....	42
<b>CHAPTER 6: RESULTS AND DISCUSSIONS.....</b>	<b>44</b>
6.1. VALUE PLACEMENT ON COASTAL ECOSYSTEM SERVICES.....	44
6.1.1. <i>Value Placement on Coastal Ecosystem Services by Local Community</i> .....	44
6.1.2. <i>How Value Placement on Ecosystem Services Lead to Ecosystem Degradation – The Case of Karimunjawa Village</i> .....	50
6.1.3. <i>Summary</i> .....	54
6.2. HOW DOES VALUE PLACEMENT ON ECOSYSTEM SERVICES SHAPE THE SOCIAL-INTERDEPENDENCIES AMONG LOCAL ACTORS? .....	54
6.2.1. <i>Social Interdependencies Among Local Actors in Karimunjawa Village</i> .....	55
6.2.2. <i>Analysis on Social Interdependencies</i> .....	58
6.2.3. <i>Summary</i> .....	64
6.3. COLLECTIVE ACTIONS IN KARIMUNJAWA VILLAGE .....	64
6.3.1. <i>Collective Actions in Karimunjawa</i> .....	65
6.3.2. <i>Why is the Collective Action in Karimunjawa the Way It Is?</i> .....	67
6.3.3. <i>Summary</i> .....	72
<b>CHAPTER 7: CONCLUSIONS .....</b>	<b>73</b>
<b>REFERENCES.....</b>	<b>77</b>
<b>APPENDICES.....</b>	<b>85</b>
APPENDIX 1: INTERVIEW GUIDELINE .....	87
APPENDIX 2: LETTER OF CONSENT – NSD FORMAT .....	89
APPENDIX 3: LETTER OF CONSENT – BRIN FORMAT .....	93

# LIST OF TABLES

---

Table 1. Ecosystem services (MEA, 2003) .....	6
Table 2. Elements of collective actions (Zaga-Mendez, 2021; based on Barnaud et al., 2018) .....	17
Table 3. Categories and description of the integrated classification of marine and coastal ecosystem services (Liquete et al., 2013) .....	28
Table 4. Summary of the respondents .....	39
Table 5. Valued ecosystem services based on the perceptions of the respondents .....	45
Table 6. Ecosystem services and the benefits they provide, as mentioned by the respondents .....	47
Table 7. Ecosystem services of seagrass and the benefits they provide, as mentioned by the respondents ...	48
Table 8. Ecosystem services of coral reefs and the benefits they provide, as mentioned by the respondents	50



# LIST OF FIGURES

---

Figure 1. Components in ecosystem service concept (based on Ring, et al., 2015 in Schröter et al., 2019).....	7
Figure 2. The social-ecological system framework as described by Ostrom (2009).....	9
Figure 3. The relationship between government-based management and community-based management, and how the sharing of power between the two can be considered co-management (Pomeroy & Berkes, 1997).....	10
Figure 4. Relationship between community and resource management (Agrawal & Gibson, 1999).....	12
Figure 5. The social interdependency framework proposed by Barnaud et al. (2018) .....	17
Figure 6. Global distribution of coral, mangrove, and seagrass diversity (Image created by Philippe Rekacewicz in May 2002 from data compiled by UNEP-WCMC, 2001) .....	21
Figure 7. Mangrove forest in Indonesia (CIFOR, 2013) .....	23
Figure 8. Examples of seagrass species found in Indonesia: <i>Cymodocea hemprichii</i> – smooth ribbon seagrass (top left), <i>Thalassia rotundata</i> – sickle seagrass (top right), <i>Halophila ovalis</i> – hairy spoon seagrass (bottom left), <i>Halodule uninervis</i> – needle seagrass (bottom right) (Ria Tan, 2010) .....	24
Figure 9. Coral reefs in Indonesia (Burhan Herjah, 2020; Fakhrizal Setiawan, 2009).....	25
Figure 10. A map showing the area within the Coral Triangle initiative (WWF).....	25
Figure 11. Interconnectivity between mangroves, seagrass, and coral reef ecosystems (Silvestri & Kershaw, 2010) .....	27
Figure 12. Map of Karimunjawa Islands, with coral reef highlighted (Taruc, 2011) .....	31
Figure 13. Zonation Map of Karimunjawa National Park (BTNK, 2012b) .....	32
Figure 14. Social-interdependencies of coastal communities in Karimunjawa using the framework proposed by Barnaud et al. (2018).....	56



# LIST OF ABBREVIATIONS

---

- BTNK : *Balai Taman Nasional Karimunjawa* (see "KNPA")
- CT : Coral Triangle
- ES : Ecosystem Services
- KNP : Karimunjawa National Park
- KNPA : Karimunjawa National Park Authority
- LIPI : *Lembaga Ilmu Pengetahuan Indonesia* (Indonesian Institute of Sciences)
- MCES : Marine and Coastal Ecosystem Services
- MEA : Millennium Ecosystem Assessment
- NP : National Park
- NRM : Natural Resources Management
- SES : Socio-Ecological Systems
- TIC : Tourist Information Center





# CHAPTER 1:

## INTRODUCTION

---

### 1.1. Background

Globally, coastal and marine ecosystems have been experiencing rapid degradation and depletion due to continuous exploitation (Barbier, 2017). Approximately half of the world's salt marshes, one third of the mangrove forests, one third of the coral reefs, and one third of the seagrass meadows have been degraded within the period of several decades (Barbier, 2017). To address this problem, government agencies, academic institutions, and various organizations have been working together to develop rules and regulations in an effort to stop further degradation of these natural resources. However, we need to understand that the burden of coastal and marine ecosystem degradation is being borne by local coastal communities that directly depend on coastal and marine resources, especially those living in less developed countries (Blasiak et al., 2017; Cinner et al., 2012). In a response to this continuous degradation, stakeholders are now gradually trying to involve local communities in natural resource management. This is demonstrated by the increasing interest in the formation of community groups and community-based conservation initiatives that not only aim to conserve vulnerable ecosystems, but also to engage and support local communities that rely heavily on common-pool resources such as fisheries, forests, wildlife, and watersheds, to sustain their livelihoods (Berkes, 2004; Pretty, 2003).

Despite their appeal in addressing environmental and social problems, community-based initiatives often face several challenges and concerns over their effectiveness and sustainability, which may lead to failure in achieving the set social and/or ecological goals (Berkes, 2004; McShane et al., 2011; Pretty, 2003; Tallis et al., 2008). To understand the success of collaborative initiatives involving communities, knowledge on how diverse groups or individuals perceive ecosystem services is required (Matta & Alavalapati, 2006). According to Lau et al. (2019), by investigating what people value about them, the concept of ecosystem services can be a useful tool to help manage vulnerable coastal and marine ecosystems. We know that ecosystems have properties that are embedded – without them being used by humans, these properties are there. The various processes that occur within these ecosystems then produce functions that are able to become foundations for the existence of society. When these ecosystems interact with and are being used by the society, they can generate ecosystem services which are basically the goods and services

that these ecosystems produce that are able to directly or indirectly benefit the human well-being (De Groot et al., 2002). This concept of ecosystem services can act as a "common language" that can facilitate and help identify alternative management practices (Granek et al., 2010). An assessment of ecosystem services is intended to connect management actions with ecosystem changes, and to gain an understanding of how these changes affect the services provided by ecosystems for different individuals and groups. Granek et al. (2010) stated that one of the many problems in management practices in coastal and marine areas lies in the aspect of communication between actors. Actors with different interests often struggle to find common grounds (Berkes & Folke, 2000; Cash et al., 2003; Weeks & Packard, 1997). These different views make it difficult to establish management practices that can accommodate the best interests of all the involved parties. This is why Granek et al. (2010) emphasized the importance of incorporating the concept of ecosystem services as a "common language", as this concept can facilitate an objective assessment of how people value ecosystem services, thus foster communication between individuals and groups, increasing the likelihood of developing management strategies that benefit all parties involved.

For a good management strategy to be formed, there needs to be good communication, strong relationships of trust, and frequent exchanges or interactions between actors, as well as established social networks that are able to strengthen the recognition of social interdependencies (Dietz et al., 2003; Muradian & Rival, 2012; in Zaga-Mendez et al., 2021). Lise (2000) stated that the active and effective involvement of local communities at different levels of resource management is one of the conditions necessary for a successful collective action. In other words, all actors involved, whether producers of ecosystem services, beneficiaries who benefit from ecosystem services, or intermediaries who mediate the distribution and utilization of ecosystem services, must realize that they are interdependent with each other. This is because the decisions that they make affect the quality and quantity of the ecosystems services that the community can obtain (Zaga-Mendez et al., 2021).

Through the case study in Karimunjawa Village, that is located in Indonesia, I seek to identify the capability of the local community to plan or even implement collective actions based on how they place value on ecosystem services that they obtain from the coastal ecosystems. I will also use the social interdependency framework proposed by Cécile Barnaud et al. (2018) as a tool to show how ecosystem services can be a "common language" that can be used to unify the perceptions of various actors. Through this framework, I also hope to identify the network of interactions and interdependencies between communities that are basically important social capital in the establishment of collective action.

## **1.2. Research Objectives and Research Questions**

To better understand the value placement on coastal ecosystem services and how collective actions can be generated through this value placement, I have developed three research objectives. The first objective is to investigate how local actors in Karimunjawa Village put value on the ecosystem services provided by three main coastal ecosystems in Karimunjawa Islands: coral reefs, mangroves, and seagrass. As stated by Granek et al. (2010) and Zaga-Mendez et al. (2021) previously, ecosystem services can act as a “common language” to promote communication among stakeholders which would eventually lead to collective actions, as long as they are aware of their interdependencies. Using this statement as a basis, the second objective is to identify the network of interdependencies that exist among local actors in the production, distribution, and utilization of these ecosystem services that have been valued by the local community. I have discussed previously that social interdependencies can provide social capital that can help shape collective actions. In relation to this, the third objective of this study is to identify the collective actions that had been conducted specifically in Karimunjawa Village. Looking at these three objectives, I have formulated the following research questions:

- a. How do local actors place value on ecosystem services provided by the three main coastal ecosystems of Karimunjawa Islands: coral reefs, seagrass meadows, and mangrove forests?
- b. Based on the ecosystem services that are valued by the local community, how do these ecosystem services help shape the social interdependencies among local community members?

By mapping the social interdependencies that exist among local communities, I hope to understand the network of interactions between actors - how they depend on and influence each other. From here, I then asked another question related to my third research objective:

- c. Based on their social interdependencies, how does the interactions that occur between local stakeholders shape the collective actions that had been conducted in Karimunjawa Village?

## **1.3. Relevance/ Importance of Research**

By answering the research questions that have been presented in the previous section, I hope this study will shed light on how important it is to understand what coastal resources mean to local stakeholders and how they put value on these resources. By knowing this, we can determine what ecosystem services are valuable to the local

community, so management can be aimed at targeting the effective delivery of these ecosystem services. In the light of growing importance of a more decentralized governance and community involvement in natural resources management, the understanding of what resources mean to local stakeholders and how they value them is hoped to foster more synergy between policy-makers and local stakeholders, resulting in the development of pragmatic, more integrated resource management strategies.

This research is also expected to provide new knowledge about the importance of understanding social interdependency in society. That way, the general public and policy-makers can see the development of the social capital that is needed to encourage communities to engage in collective actions. After all, well-fostered collective actions are most likely to result in a better community-based management or co-management.

## CHAPTER 2:

# THEORETICAL BACKGROUND

---

This chapter will explain how society and ecosystems interact, and how ecosystem services can be formed from these interactions. This is followed by a description of power-sharing points in the realm of natural resources management, especially the involvement of local communities as direct users of these natural resources. From this point, I will then get into how stakeholders in this diverse management domain form a network of interdependencies, and how these interdependencies may encourage them to work together to form collective actions.

### 2.1. Ecosystem Services and Society

First of all, this sub-chapter will explain a little bit about what ecosystem services are and how the concept of ecosystem services can be constructed due to the interaction between humans and ecosystems. This is then followed by an explanation of the importance of incorporating the concept of ecosystem services into natural resource management that has been increasingly involve the participation of local communities. As mentioned previously, ecosystem services can be used as a "common language" that can help identify both common interests and conflicting interests in how people benefit from ecosystem services. To identify these interests, I used the social interdependencies framework developed by Barnaud et al. (2018). From these interests, I can then identify how local actors form a network of interdependencies that arise because of how they all benefit from the distribution of ecosystem services, making it easier to identify factors that can support or hinder collective action.

#### 2.1.1. What Are Ecosystem Services?

The Millennium Ecosystem Assessment (MEA) defined ecosystem services as the benefits provided to humans by ecosystems – with the assumptions that these ecosystems services contribute to the human well-being (Barbier, 2017; Mahajan & Daw, 2016). Services provided by ecosystems include provisioning services, regulating services, supporting services, and cultural services (MEA, 2005). Table 1 presents a list of general ecosystem services and their examples.

**Table 1. Ecosystem services (MEA, 2003)**

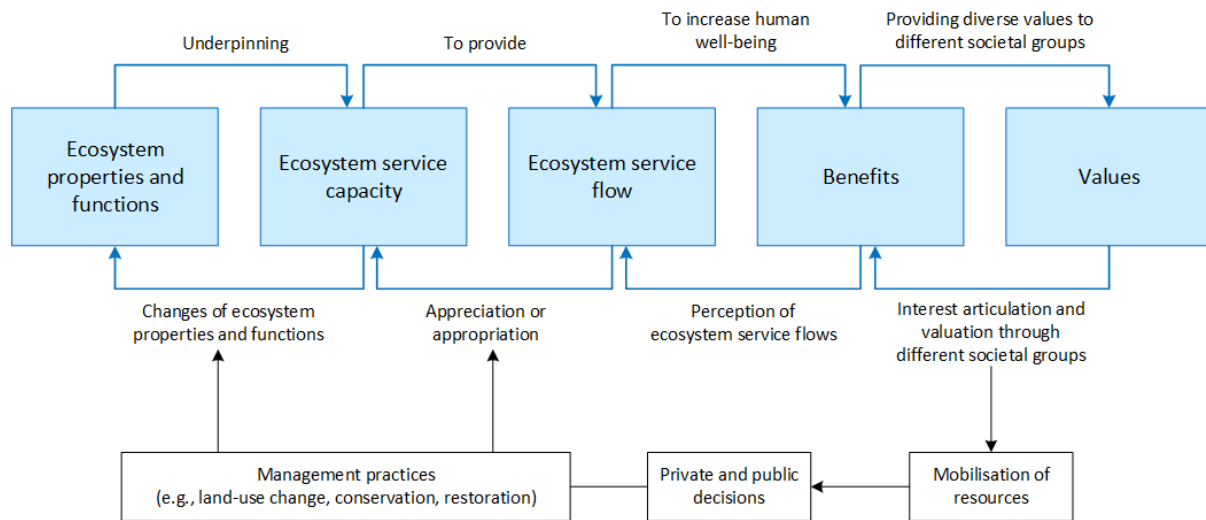
<b>Category</b>	<b>Examples of Ecosystem Services</b>
Provisioning Services	<ul style="list-style-type: none"><li>• Food</li><li>• Fresh water</li><li>• Fuelwood</li><li>• Fiber</li><li>• Biochemicals</li><li>• Genetic resources</li></ul>
Regulating Services	<ul style="list-style-type: none"><li>• Climate regulation</li><li>• Disease regulation</li><li>• Water regulation</li><li>• Water purification</li><li>• Pollination</li></ul>
Supporting Services	<ul style="list-style-type: none"><li>• Soil formation</li><li>• Nutrient cycling</li><li>• Primary production</li></ul>
Cultural Services	<ul style="list-style-type: none"><li>• Spiritual and religious</li><li>• Recreation and ecotourism</li><li>• Aesthetic</li><li>• Inspirational</li><li>• Educational</li><li>• Sense of place</li><li>• Cultural heritage</li></ul>

Although ecosystem services are divided into four categories, an ecosystem does not always offer all four types of ecosystem services simultaneously (Barbier et al., 2011). Due to the intricate nature of any ecosystem, it is usually assumed that humans benefit from a combination of several ecosystem services. Barbier et al. emphasized that ecosystem services offered by different ecosystems (forest, marine, mangrove, seagrass, coral reefs, etc.) have different properties; the consequences of their use are also different. Some ecosystem services can directly affect human livelihoods through the provision of food, clean water, aesthetic values. On the other hand, other ecosystem services affect general environmental conditions that are indirectly influenced by humans, such as climate change, erosion prevention, and natural disaster prevention. Now that we understand what ecosystem services are, the next sub-section will elaborate on how ecosystem services are formed by the interaction between humans and ecosystems.

### **2.1.2. From Ecosystem Functions to Ecosystem Services**

Granek et al. (2010) emphasized that ecosystem functions and ecosystem services are not synonymous, and that ecosystem services may depend on ecosystem functions. According to Granek et al., there will be no concept of ecosystem services if there are no demands coming from humans from those ecosystems. Schröter et al. (Schröter et al., 2019) explained that ecosystem services are basically conceptualized as a "series of

components that play a role in the relationship between nature and human well-being”, as modelled in Figure 1.



**Figure 1. Components in ecosystem service concept (based on Ring, et al., 2015 in Schröter et al., 2019)**

Ecosystem properties include the structures and processes occurring in ecosystems and landscapes within its spatial and temporal variability (e.g., soil properties, biotic material production, nutrient cycles, biological diversity) that shapes the basis for the existence of society and any kinds of ecosystem services that are usable by humanity (Bastian et al., 2012). The term “functions” in this sense refers to the definition suggested by Forman and Godron (1986), which is the “interactions among spatial elements, such as the flows of energy, material, and species among the component ecosystem”. According to The Economics of Ecosystems and Biodiversity study (in Forman & Godron, 1986), ecosystem functions are seen as merely ecological phenomena. With this, it can be said that ecosystem properties and functions are a series of ecological interactions in which the structure of ecosystems and flows of energy, matter, and information are being influenced (Schröter et al., 2019). De Groot et al. (2002) and Willemsen (2010) stated that within ecosystem functions, there is a capacity for natural processes and components of ecosystems to provide goods and services that can either directly and/ or indirectly satisfy human demands. There is also the term “ecosystem potentials” as presented by Bastian et al. (2012), which refers to the assessment of nature’s goods with the intention to display the service capacities of an ecosystem as a field of possibilities available for society to use. Bastian et al. further explained that ecosystem service flow is the actual use of ecosystems, this will then result in the delivery of services or benefits through either appreciation or appropriation. The value in this sense refers to the importance of ecosystem services, and it can vary, depending on societal norms, traditions, beliefs, as well as individual needs, preferences, and principles (Bastian et al., 2012). If a service is

deemed valuable, society will express interests and resources will be mobilized to appropriate and manage that service. This could lead to private and public decisions that could either directly or indirectly affect how resources are used through the implementation of policy strategies.

The provision of ecosystem services is not only driven by ecosystem properties, functions or natural capital, according to Spangenberg et al. (2014). This is supported by Burkhard et al. (2012) and Castro et al. (2013) with them stating that ecosystem services is also influenced by societal needs. The flow of ecosystem services is a result of a variety of biophysical, social, and institutional factors such as land management practices. Anthropogenic inputs are required for a service to be able to be used, which may include the utilization of technology or knowledge. Additionally, Schröter et al. (2019) emphasized that ecosystem services can be perceived differently, depending on markets, societal norms, traditional practices, among other things. This is why it is important to understand how communities value these services and to raise awareness in areas where services are being taken for granted in order to sustainably manage ecosystem services.

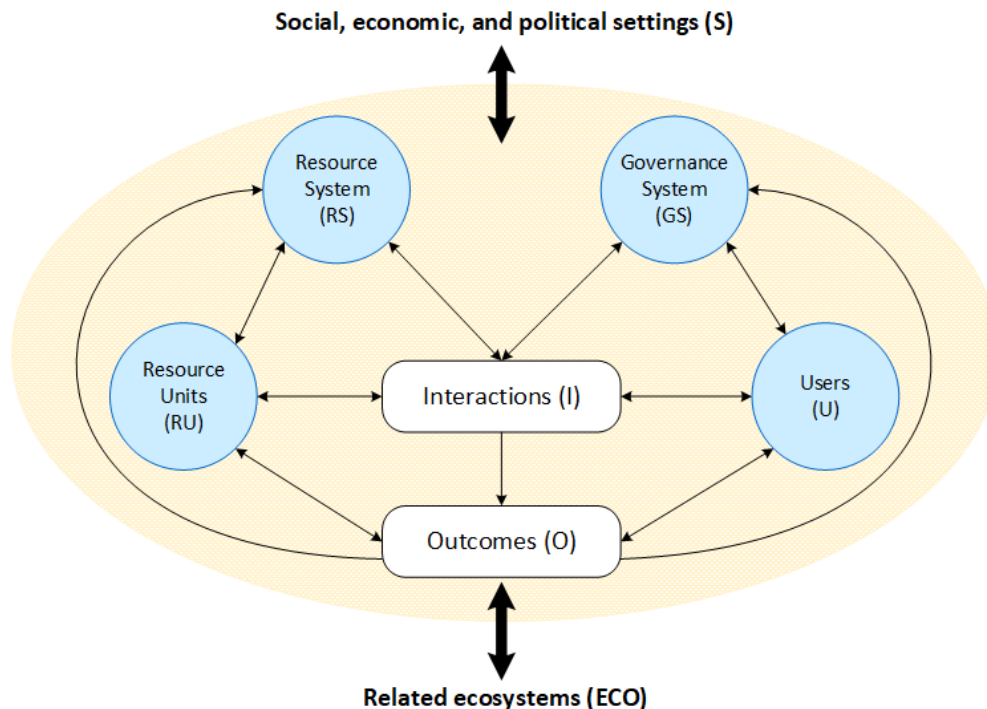
### **2.1.3. The Concept of Ecosystem Services in Natural Resources Management**

The concept of ecosystem services is now gradually being incorporated into local management practices, for example, through protected areas, watershed councils, or urban planning (Grêt-Regamey et al., 2017). Schröter et al. (2019) claimed that ecosystem services concept can act as an analytical tool to understand some aspects of human-nature relationship. One of the challenges for resource managers is how to operationalize this concept in a way that makes sense to local stakeholders and help them manage social-ecological systems (SES) sustainably. SES consists of linked systems of humans and nature, emphasizing that humans must be seen as a part of, and not separated from, nature (Berkes & Folke, 2000). SES are complex adaptive systems in which social and biophysical agents interact at different temporal and spatial scales (Janssen & Ostrom, 2006).

In the SES framework, social subsystems interact with ecological subsystems and their institutional systems to produce ecosystem services, which are then managed and directed by social subsystems. Ostrom (2009) explained that in a complex SES, subsystems such as resource systems (e.g., coastal fisheries), resource units (e.g., certain type of fish), users (e.g., fishermen), and governance systems (e.g., organizations or bodies that govern coastal fishing) interact to generate outcomes at the SES level, which in turn result in a trickle-down effect, affecting the other larger or smaller sub-systems, as shown in Figure 2. According to Barnaud et al. (2018), since SES are both complex and



multiscalar, their governance needs to be polycentric; meaning that it should combine diverse coordination mechanisms, including market-based mechanism, state-based mechanism, as well as collective action mechanism that involve local stakeholders.



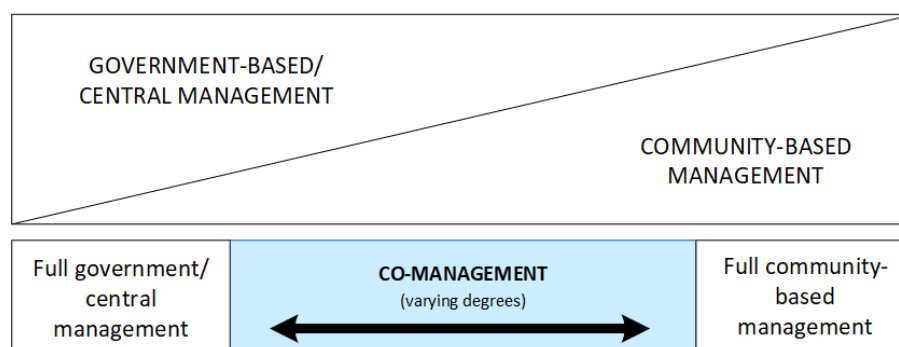
**Figure 2. The social-ecological system framework as described by Ostrom (2009)**

Due to the interconnectedness structure of ecosystems, management actions have the potential to simultaneously affect a variety of ecosystem services and, as a result, a large number of people from different groups within the society (Granek et al., 2010) – as shown in Figure 1, how decisions coming from private or public parties affect the implementation of management strategies, ultimately influencing how the ecosystems are being altered and utilized. The diverse group of stakeholders involved in most of coastal management issues (e.g., fishermen, the tourism industry, conservation groups, coastal residents, indigenous peoples, and upstream landowners), is likely to cause disagreements regarding the most effective way to manage coastal ecosystems. According to Granek et al. (2010), defining decision-making process in relation to ecosystem services can take account the ecological and socio-economic complexity that comes with working at the ecosystem scale and take account the views of a wide range of interested parties. Incorporating ecosystem services can make the decision-making process easier by giving stakeholders involved a common set of facts and a common way to measure trade-offs, which can help in difficult negotiations between groups with different goals. This leads to the idea that ecosystem services can be referred to as a “boundary object” (Abson et al.,

2014), as they link and bind together varying views of different stakeholders from various disciplines and decision makers, who work together at the interface of ecological and socio-economic systems.

#### 2.1.4. Power-sharing in Natural Resource Management

In relation to how resource management is being implemented by various stakeholders, the management of natural resources has experienced significant transformation over the last several decades (Natcher et al., 2005). Once primarily the job of state administrators, responsibility is now increasingly being shared with people who are most reliant on the continuous availability of a resource, such as fishermen, farmers, herders, and pastoralists. Natcher (2005) claimed that these systems of joint authority, which are referred to as co-management in general, have evolved from the informal agreements between local resource users and district managers into complex decision- and policy-making bureaucracies.



**Figure 3. The relationship between government-based management and community-based management, and how the sharing of power between the two can be considered co-management (Pomeroy & Berkes, 1997)**

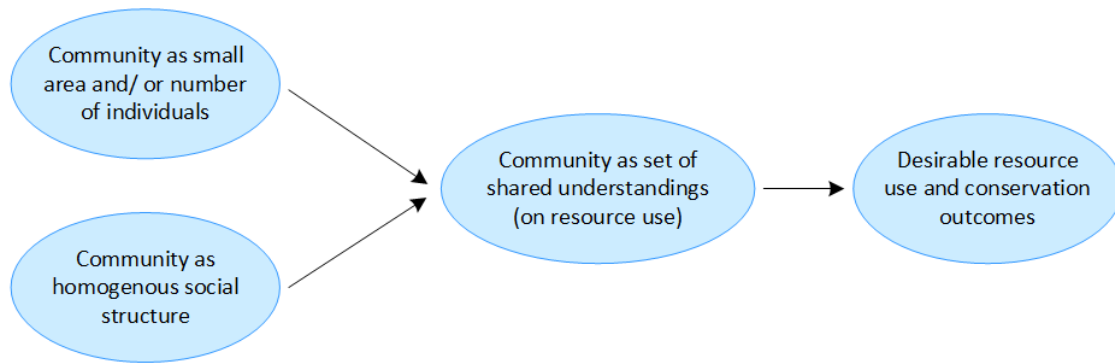
According to Carlsson and Berkes (2005), cooperative administration of common-pool resources, such as fisheries and forests, is typically considered to consist of some form of power-sharing system between the state and the community. Solutions to the commons problem, according to Pomeroy and Berkes (1997) recognize three basic kinds of property rights regime: (i) rights to resources are controlled by government agencies on behalf of the citizens, (ii) common property means that the rights to resources are held by a community of users who can regulate their own use and even exclude others, (iii) private property means an individual or a private body has the rights over the resources. By this, what does co-management actually mean? Pomeroy and Berkes explained that co-management is a "middle course between pure state property and pure communal property regimes" (Figure 3). Co-management involves the recognition and legitimization of local-level management systems, whether they are traditional or formal. A primary

reason for co-management is the idea that increased stakeholder engagement would improve the efficiency and, perhaps, the equality of the interrelated common property resource management and social systems (Castro & Nielsen, 2001). Resource users may be able to get a private share of the authority and decision-making capabilities that underpin management through co-management.

### **2.1.5. Community Involvement in Resource Management and Collective Actions**

What exactly is a “community”? The management of natural resources has been increasingly involving social organizations referred to as a “community”, with varying formations – from place-based groups to interest-based alliances (Ojha et al., 2016). The term “community” in Ojha’s study refers to a group of actors that act together based on some common goals, while not necessarily sharing a common geographic space; whereas “local community” denotes a group of people who share the same geographic space, while also having the same goals in regards to natural resources management. Based on this, Ojha et al. see community as two different sets of attributes: based on common goals, and based on common goals as well as shared space. Agrawal and Gibson (1999), on the other hand, reveals the three most important aspects of community for the advocacy of positive roles for communities in resource management: community as spatial unit, as a homogenous social structure, and as a set of shared interests or norms.

First, community as a spatial unit is related to how group members who share the same geographical space are more likely to interact with each other more often. Because of the continuous interaction between members, territorially constrained groups may be able to develop unique methods of managing the resources near where they live. It is also quite cost-saving to arrange collective decision. Second, community as a homogenous social structure is related to how homogeneity of the group members leads to a more often, regular interactions. Agrawal & Gibson (1999) stated that theoretically, communities are often assumed to be consisted of similarly endowed (in terms of assets and incomes), relatively homogenous household that share common characteristics such as ethnicity, religion, caste, or language. It is believed that such homogeneity will encourage cooperative actions, lessen hierarchical and confrontational interactions, thus promoting better resource management. Third, community as common interests and shared norms is a concept that depends strongly on the perceptions of its members. The existence of shared norms will encourage cooperative decision-making within the community. If members of the community belief in shared identities and experiences, there is a higher possibility for them to cooperate to manage natural resources. Figure 4 shows the relationship between different properties of community, and how they connect with desirable collective decisions.



**Figure 4. Relationship between community and resource management (Agrawal & Gibson, 1999)**

The increasing involvement of community in resource management has been caused in part by the realization that this strategy can produce more satisfying results compared to individual or classical firm-based market arrangements as well as government-based management strategies (Agrawal & Gibson, 1999). Ostrom (1990) stated that these community-based solutions is expected to give out a number of environmental benefits; one of them is a better and more effective environmental management based on collective action. However, Agrawal & Gibson (1999) argued that although similarities in characteristics or attributes in communities might facilitate collective action, some community characteristics that are considered important to collective action can actually thwart conservation efforts. For example, norms that are being strongly held within a community might actually be supporting exploitative behaviors. Small-sized groups may be unable to protect their resources from significant external threats, or that they won't be able to effectively manage their resources if they are dispersed across wide areas. Additionally, Ojha et al. (2016) disclosed that the problem with community-based collective actions is that they are often influenced by outside forces instead of internal collective action. Ojha et al. further explained that in natural resources management, external actors come to local domains through expanding markets, civil society, and regulatory regimes. Their arrival increases the interaction between local communities and these non-local actors in various ways; and through these interactions, they are forming diverse networks. This is how community-based management of natural resources involving local communities becomes "delocalized". On his study, Ojha et al. claimed that "local community" hardly exists independent of its relationship with actors beyond local scale.

Agrawal & Gibson (1999) argued that in order to accurately depict the relationship between communities and natural resources, it would be better to put attention on these three critical aspects of communities: the multiple actors with multiple interests that make up communities, the processes in which these actors interact with each other, and the institutional arrangements that structure the way in which they interact. First, the multiple

actors and multiple interests is related to how individuals often shape different sub-groups within a community. A community does not only comprise of people who possesses similar endowments or goals. To advocate community-based programs, we have to acknowledge the variety of players and interest that are at play within a community and find ways in how to create a collaboration. Agrawal & Gibson emphasized that recognizing this also means empowering the local communities to better use and manage natural resources, and more than just decentralizing authority over natural resources management from central government to communities.

Second, according to Agrawal & Gibson, it is impossible to properly explain interactions at the local level using simple analyses of phenomena that occur locally. Local interactions occur within the context of the wider social dynamics that are at play. examples of direct influence on local level include attempts made by the government to adopt community-based conservation as well as specific projects of NGOs that aim to involve communities. Other than that, it seems that interactions that happen locally can also prompt responses from macro-level stakeholders. For example, local communities' reaction towards certain management practices may lead to modifications of these practices. From this, it is apparent that local and external actors are linked together, thus making it difficult to trace back where exactly local conservation begins (Agrawal & Gibson, 1999). Coastal and island communities have traditionally used and maintained their essential marine resources based on their relied expertise and experiences that have been passed down from generation to generation (Beyerl et al., 2016; McMillen et al., 2014). Nowadays, these endeavors are often being supported by outside partners, such as governmental agencies, NGOs, and even academic research teams, who provide ecological evaluations in addition to guidance on modern management techniques (Glaser et al., 2015; Mühlig-Hofmann et al., 2004). Under whatever circumstance, all community-based resource management basically takes place within a complex socio-ecological environment, and they are influenced by external factors and internal community-specific conditions (Beyerl et al., 2016).

Third, institutional arrangements can be seen as sets of customs and rules (both official and informal) that define the ways in which people interact with one another and with nature (Agrawal & Gibson, 1999). Oftentimes, institutions provide mechanisms that can mediate, soften, attenuate, structure, mold, accentuate, and facilitate particular outcomes and actions (Ensminger, 1992; Alston et al., 1996; Gibson, 1999; in Agrawal & Gibson, 1999). When actors do not share the same goals for nature conservation, institutions can serve as an aid in the interaction between actors. Aside from that, institution can even define the interactions that must be taken to achieve conservation goals. It is important to note, however, that to manage natural resources well at the local

level, local actors must have authority and control over three important areas: making rules about the utilization, management, and conservation of resources, implementing the rules that are created, and the resolving the disputes that come up when the rules are being put into action (Agrawal & Gibson, 1999)

#### **2.1.6. Community Perceptions on Ecosystem Services in Collective Action**

"Perceptions", according to Jefferson et al (2015), *"is an umbrella term which includes components such as knowledge, interests, social values, attitudes, or behaviors"*, and this provide insights on how people may respond to ecosystem management initiatives (Elwell et al., 2018). The efficacy of management initiatives largely depends on communities' participation and support (Jefferson et al., 2015). As discussed in previous sub-section, rather than focusing on communities based on their similar attributes, Agrawal and Gibson (1999) suggested that greater attention should be given to one of the most critical aspects of communities: the multiple actors who have multiple interests that make up communities. Collective actions in natural resources management, based on the definition by Scott & Marshall (2000), involves participation from various individuals, even within one community. Community itself is a diverse entity, and therefore, the members' sources, access to knowledge, and their perceptions and understanding of collective action may differ (Matta & Alavalapati, 2006). Another thing that can be perceived differently by community members is ecosystem services. As emphasized by Schröter et al. (2019), ecosystem services can be perceived differently, depending on markets, societal norms, traditional practices, among other things.

Elwell et al. (2018) stated that insights to people's perceptions of different ecosystem services may be useful to guide management efforts through three key ways. Those insights might help to: (i) define which ecosystem services matter the most to local communities, (ii) compare how people perceive ecosystem services in relation to how important they think they are to their well-being, (iii) determine how people view the effects that management interventions will have on the environment and future well-being. By understanding how coastal communities connect with marine environments and the issues surrounding them, engagements, initiatives, and regulations can be developed to resonate with the communities, therefore creating the greatest possible outcome for marine conservation efforts (Jefferson et al., 2015). Additionally, this is done to guarantee that the conservation activities are supported by the public, accepted by society, adhered to, and participated in (Daigle et al., 2016; Gkargkavouzi et al., 2020; Potts et al., 2016).

### 2.1.7. Collective Actions and the Social Interdependencies

As Carlsson & Berkes (2005) has stated, the management of common pool resources usually involves some kind of power-sharing system between the government and local communities. Common-pool resources, according to Steins & Edwards (1999), are the kind of resources in which the exclusion of users is difficult and almost impossible to achieve, and in which the joint use of these resources reduces the availability and benefits provided to others – in other words, common pool resources can be considered “non-excludable goods”. Hardin (1982) refers to this kind of resource as “public goods”. Suharti et al. (2022) claimed that resource management characterized by common-pool resources (CPR) calls for collective action for its sustainable management, and this is supported by several other studies (Duraippah et al., 2014; Miyanaga & Shimada, 2018; Muradian et al., 2013; in Zaga-Mendez et al., 2021). The reason is that there needs to be a control over the access of the common-pool resources and the distribution of the benefits that they provide (Steins & Edwards, 1999). Additionally, Berthet et al (2022) stated that collective action can be a good way to avoid the problems that come with policy- and market-based approaches. This is so that arrangements between ecosystem service providers and beneficiaries can be formed and trade-offs between ecosystem services can be resolved, leading to win-win solutions.

Since the threats of resource depletion, overfishing, consumerism, population growth, and climate change have been looming larger and larger, there has been a growing need to promote collective actions that can ensure more sustainable use of natural resources (Kitolelei & Sato, 2016). So, what are “collective actions”? Collective actions, by definition, means *“actions taken by a group of people (either directly or through an organization on its behalf) in pursuit of the people’s perceived shared interests”* (Scott & Marshall, 2009; in Mills et al., 2011). Ecosystem services are considered as collective outcomes that are “co-produced” by the landscape, the social relationships and interdependencies between individuals, producers and beneficiaries, as well as between the living and the non-living environment (Barnaud & Antona, 2014; Barnaud et al., 2018). In this context, the term “co-production” refers to the interconnectedness of social and biophysical processes that “produce” ecosystem services. These ecosystem services can be thought of as emergent ecological (biophysical) linkages as well as socio-cultural ones (Barnaud & Antona, 2014). With this as the basis, Zaga-Mendez et al. (2021) concluded that there is a *“need for institutional spaces that acknowledge socio-ecological interdependencies around (ES) as well as the development of a system of rules, norms, and social conventions that allow for their pooling together”* (based on McGinnis, 2011; Ostrom et al., 2012; in Zaga-Mendez et al., 2021).

When local communities are able to recognize the interdependencies among themselves, they can easily establish communication which fosters mutual trust, and increases their level of interaction. It is important that these components are met, so that they can form solutions to socio-ecological problems. This is because the actions of these communities interconnect and have impact on the quality and quantity of the ES that they can receive (Zaga-Mendez et al., 2021). This is as stated by Westerink et al. (2017; in Zaga-Mendez et al., 2021), the development of trust between stakeholders can lead to social obligations and a reciprocal sense of trust which are both essential components of social capital that contribute to collective actions.

However, although collective action may seem like a management mechanism that is best applied to common-pool resources, according to Ostrom et al. (1994; in Barnaud et al., 2018), collective actions aren't always appropriate and has various inherent risks; such as social exclusion and loss of autonomy, as well as costs, such as transaction and monitoring costs. Additionally, the presence of power asymmetries and conflicting interests hinder collective actions, which requires not only social learning, trust building, and mutual understanding, but also negotiation and conflict management processes (Barnaud et al., 2010; Leeuwis, 2000; Pahl-Wostl, 2007; in Barnaud et al., 2018).

#### **2.1.8. The Social Interdependency Framework**

To understand social interdependency among local communities, Barnaud et al. (2018) proposed a framework that involved the complexity of ecological processes, social embeddedness among stakeholders, and institutions involved in the collective management of natural resources (Figure 5). According to Barnaud et al., collective action is a "*voluntary process of cooperating among various stakeholders, users, and managers where they address a common ecosystem services management problem in a given territory*". Barnaud et al. emphasized that collective action requires social learning, mutual trust, collective and mutual understanding, as well as negotiation and conflict resolution. From these components, stakeholders can identify the interdependencies that exists among them, which then become the main key in implementing the cooperation of various stakeholders. In using this framework, to be able to illustrate the social interdependencies, the main things that must be determined is the action arena, the roles held by the stakeholders that are involved, and the types of interdependencies that exist among actors (Zaga-Mendez et al., 2021).



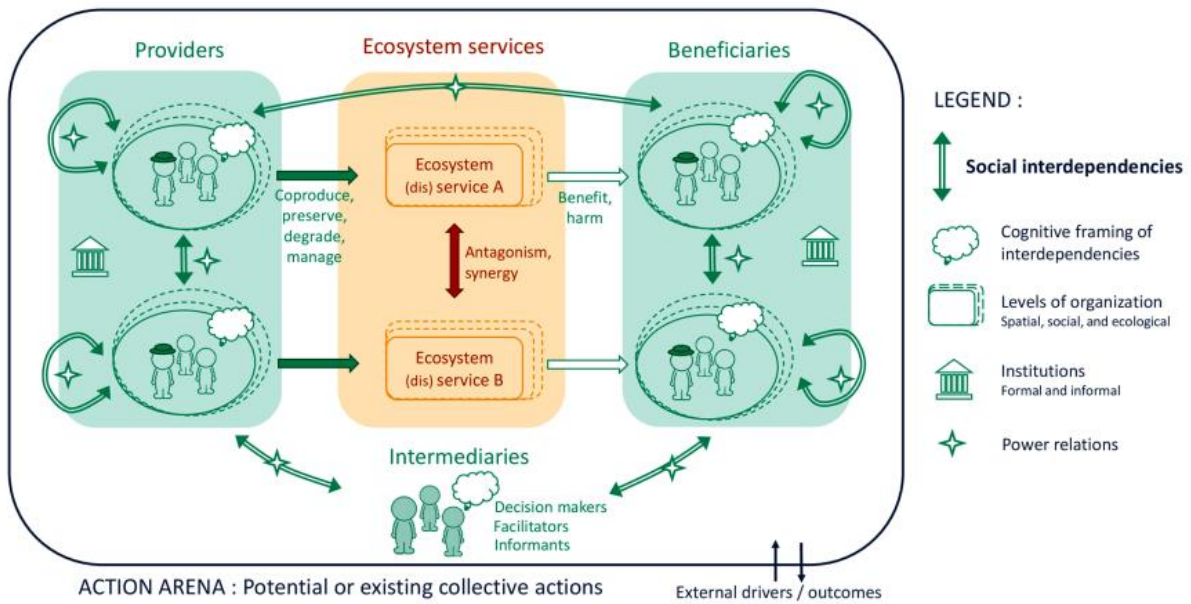


Figure 5. The social interdependency framework proposed by Barnaud et al. (2018)

In addition to that, it is also necessary to determine several dimensions including cognitive framing of interdependencies, levels of organizations, institutions, and existing power relations. The description for each of these components is presented in Table 2.

Table 2. Elements of collective actions (Zaga-Mendez, 2021; based on Barnaud et al., 2018)

Elements	Characteristics
Action arena	The social sphere where participants or stakeholders interact around a subset of ecosystem services (region, municipality, watershed).
Socio-ecological interdependencies associated with ecosystem services or disservices	The relationship formed between humans and the visible and invisible environment, which affects human well-being. Changes in the quality of ecosystem services received by humans can affect relationships between stakeholders. Recognition of interdependencies affects stakeholders' awareness, motivation, and ability to take collective action.
<b>Social roles</b>	
Providers or co-providers	Stakeholders whose activities contribute to the production, degradation, preservation, and management of ecosystem services.
Beneficiaries or co-beneficiaries	Stakeholders who receive benefits from ecosystem services. Examples: those who have access to the ecosystem; tourists, conservationists, politicians, government, etc.
Intermediaries	Stakeholders who interact with providers and beneficiaries of ecosystem services that can influence decision-making processes. Examples: rule-makers, facilitators or negotiations, informants, advisors, etc.
<b>Social interdependencies among stakeholders</b>	
Between providers	The mutual benefits gained from coordination between providers. Sometimes these mutual benefits can lead to conflict.

	Recognition of this interdependence among providers depends on the presence or absence of institutions.
Between beneficiaries	Relationships that are formed based on common interests around the distribution of ecosystem services. Conflicts can occur among beneficiaries if there are interests in ecosystem services that are antagonistic.
Beneficiaries – providers	A relationship that is formed due to the dependence of the beneficiaries on the provider's ability to co-produce ecosystem services. This relationship can be asymmetric, as the provider is not necessarily dependent on the beneficiaries. Conflicts can occur if there are different interests coming from both sides.
<b>Dimensions of social interdependencies</b>	
Cognitive framing of interdependencies	Recognition of socio-ecological and social interdependencies around key ecosystem services; including stakeholders' perceptions of what ecosystem services are and how their actions relate to the condition and quality of these ecosystem services.
Levels of organization	Refers to the levels of ecosystem services management, as well as potential mismatches between management levels and ecological processes and patterns.
Institutions	Recognition of formal or informal rules governing social interdependence, which govern the provision of ecosystem services. This includes multi-level governance of collective action and the institutional context that supports (or does not) coordination.
Power relations	The existence of mechanisms that influence how stakeholders can assert their interests on specific issues related to ES management, which affects the overall outcome. Example: collective processes dominated by powerful stakeholders result in unfair outcomes.

These social interdependencies, according to Barnaud et al. (2018), can involve both distant and close people who have either mutual or conflicting interests. They can also be influenced (or not influenced) by the rules or regulations that exist in the existing action arena. Barnaud et al. stated that this framework can be used to characterize social interdependencies related to ecosystem services, and to explain potential or existing collective actions. The ecosystem services lens can act as an aid in raising local people's awareness of their social interdependencies so as to contribute to encouraging, framing, or enriching collective actions within an action area.

## 2.2. Summary

This chapter basically focuses on explaining the theories that I used as the basis for this research. It starts with an explanation of what ecosystem services are and how ecosystems can be formed due to social construction. From here it appears that ecosystem services are not directly embedded in ecosystems, but a series of byproducts of ecosystem properties and ecosystem functions that have been assessed and valued by the users of these ecosystems. As discussed earlier, ecosystem services can act as a "common

language" that can unite various stakeholders through how they place value on ecosystem services. In order to determine the network of interdependencies between local communities as co-producers, beneficiaries, and mediators of the valued ecosystem services, this study seeks to establish commonalities in how they view and value these ecosystem services.

## CHAPTER 3:

# MATERIAL BASIS

---

In this study, I am looking into coastal ecosystems in the Karimunjawa Islands, especially around Karimunjawa Village. However, given that there are many types of coastal ecosystems, I will only focus on the three main coastal ecosystems: mangroves, seagrasses, and coral reefs. In this chapter, I will provide a general overview of these three main ecosystems, including their importance, and what ecosystem services they provide for the well-being of local communities.

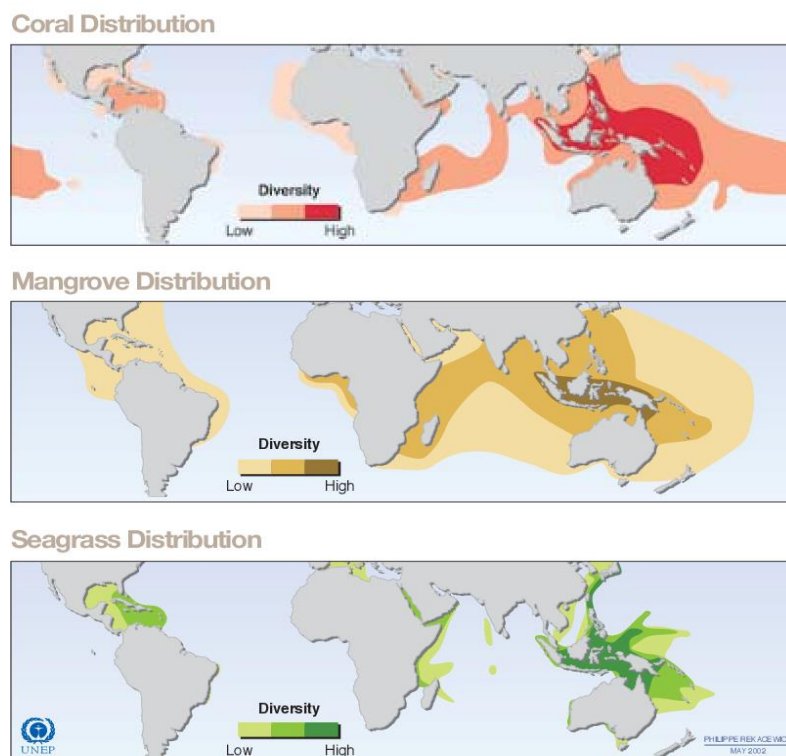
### 3.1. Coastal and Marine Ecosystems

There has been some debate on how researchers define “marine” and “coastal” systems. Some consider the coastal system to be a component of the marine system, while others believe they are distinct ecosystems that should be recognized separately. The National Geographic Society (2022) defines marine ecosystems as aquatic environments with high amounts of dissolved salt. These environments include the open ocean, the deep-sea ocean, and coastal marine ecosystems. On the other hand, the Millennium Ecosystem Assessment (MEA) (in UNEP, 2006) defines marine system and coastal system differently. According to MEA, the marine system encompasses marine waters from the low-water mark to the high seas and deep-sea water habitats up to 50 meters in depth. Whereas the coastal system includes terrestrial areas dominated by ocean influences such as tides and aerosols, as well as nearshore marine areas. Several studies have used the term “marine coastal ecosystems” to refer to the area where the land and the water converge (Bayraktarov et al., 2016; Townsend et al., 2011; Vizzini, 2009). In my study, I am using the simpler term “coastal system”, simply because it focuses on ecosystems located in the coastal zone. Including the term “marine” would give the impression that the focus of this research encompasses all marine ecosystems, including the deep sea, which appears to be too broad in relation to the scope of the study.

Marine and coastal ecosystems are one of the world's most productive yet vulnerable ecosystems (MEA, 2005). Coastal regions only make up to 4% of the earth's total land area, and only 11% of the world's oceans; yet this area is home to more than one-third of the earth's population. The shelf areas consist of many types of ecosystems, including freshwater and brackish water wetlands, mangrove forests, estuaries, marshes, lagoons and salt ponds, rocky or muddy intertidal areas, beaches and dunes, coral reef

systems, seagrass meadows, kelp forests, nearshore islands, semi-enclosed seas, and nearshore coastal waters of the continental shelves. These shelf areas provide a variety of essential ecosystem services. The shelf ecosystems contribute to at least 25% of worldwide primary productivity, 90-95% of global marine fisheries capture, 80% of global carbonate production, 50% of global denitrification, and 90% of global sedimentary mineralization (UNEP, 1992).

In relation to the location that has been chosen for this study, it is necessary to understand coastal ecosystems located specifically in the tropics. Coastal systems include many ecosystems, including estuaries, lagoons, mangrove forests, backwaters, salt marshes, rocky coastlines, sandy beaches, and coral reefs (Baweja et al., 2016). According to Nittrouer et al. (1995), coastal systems in the tropics are fundamentally different than at higher latitudes, and more diverse. This is mainly because of direct factors resulted from latitudinal location, such as higher solar radiation, higher temperature, higher precipitation, higher freshwater runoff, easterly trade winds, and weak Coriolis force. Coastal ecosystems of the tropics, that are mainly represented by mangrove forests, seagrass meadows, and coral reefs, are rich in biodiversity and extremely productive (Inoue, 2015). They are the three ecologically distinct ecosystems found in the tropical zones (Gnanadesikan & Ronald, 2006), which generally include regions such as the northeastern South America, west-central Africa, and the Indo-Pacific archipelago (Nittrouer et al., 1995).



**Figure 6. Global distribution of coral, mangrove, and seagrass diversity (Image created by Philippe Rekacewicz in May 2002 from data compiled by UNEP-WCMC, 2001)**

According to Burke et al. (2001) the region with the greatest mangrove, seagrass, and coral reef diversity is in the Southeast Asia region (part of the Indo-Pacific archipelago), particularly in the proximity of the Indonesian Archipelago and some other neighboring countries, as seen on Figure 6. Coastal ecosystems in this region are repositories of biological diversity and offer various goods and services (Ayyam et al., 2019). They contribute significantly to the livelihoods of coastal populations and to reducing the effects of natural disasters. The following sub-sections provide summaries of each of the three main coastal ecosystems in the tropics to help better understand why preserving them is important.

### **3.1.1. Mangrove Forests**

The term "mangrove" refers to a group of salt-tolerant plant species that can be found in streams, sheltered coasts, and intertidal estuarine areas in tropical and subtropical climates (Ayyam et al., 2019). Mangrove is a unique ecosystem that connects the land and the sea, and it supports habitats that are home to a broad variety of plant life and serves as a refuge for a huge array of plant and animal species (Ayyam et al., 2019). Not only do they provide timber for coastal communities, they also provide shelter and nursery areas for various commercially-valuable fish and crustaceans (CBD, 2010). Additionally, they serve as vital energy barriers, protecting low-lying coastal communities from the effects of storms that originate further offshore. Besides that, mangrove roots capture sediments that are washed away from the land towards the sea. In the saline mangrove sediments, there are particular microbial communities which help in nutrient release and breakdown.

In Indonesia, mangrove forests account for 76% of the total mangroves in Southeast Asian region (Hutomo & Moosa, 2005). As of 2020, Indonesia has the largest mangrove forest in the world, covering approximately 2.7 million hectares (Basyuni et al., 2022). Even though mangrove forests only occupy 1.3% of the planet's surface area, they support 10% of the flowering plants, 12% of the mammals, 16% of the reptiles and amphibians, 17% of the birds, and 35% of the fish (Tomlinson, 2016; in Basyuni et al., 2022). According to Basyuni et al. (2022), in Indonesia, there are 157 species of mangrove flora – including 52 tree species, 21 shrub species, 13 liana species, 7 palm species, 14 grass species, 8 herb species, 3 parasite species, 36 epiphytes species, and 3 fern species. Additionally, in Indonesian mangrove forests, there are roughly 122 species of invertebrates, 45 species of fish, and 148 species of terrestrial fauna.

Most mangroves can be found in hydrogeomorphic settings: river deltas, estuaries, and oceanic habitats (Worthington et al., 2020). Oceanic mangroves are often found

across small islands, where the shorelines are steeper with lesser sediment inputs and availability, therefore having a smaller area than delta and estuarine mangroves (Basyuni et al., 2022). Mangroves found in oceanic habitats are also linked to other coastal ecosystems, such as coral reefs and seagrasses.



**Figure 7. Mangrove forest in Indonesia (CIFOR, 2013)**

### **3.1.2. Seagrass Meadows**

According to Ayyam et al. (2019), seagrasses are submerged aquatic vegetation that have evolved from terrestrial plants over a period of time. They possess roots that can help themselves to hold in place and specialized in extracting minerals and other nutrients from sediments. Seagrass produces a large amount of biomass overall thanks to its extremely high carbon assimilation rate. For commercial and recreational fisheries and the numerous invertebrates born within or moving to seagrasses, seagrass habitat provides food, shelter, and vital nursery grounds. When various seagrass species coexist, their leaves can hide young fish, smaller finfish, and benthic invertebrates (Ayyam et al., 2019). They also provide an important food source for megaherbivores, such as green sea turtles, dugongs, and manatees (Hemminga & Duarte, 2000).

The ecosystem of seagrass is highly unique and essential for tropical coastal regions. It serves several purposes within ecosystems and is extremely valuable from an ecological and economic standpoint. They significantly impact the physical, chemical, and biological conditions of coastal waters, serving as ecological engineers and delivering a variety of vital ecological services to the marine environment (Costanza et al., 1997).

Seagrass can be found all over the planet, but the Indo-Pacific region, including Indonesia, has the most biodiversity (Waycott et al., 2009). However, despite that, seagrass has become the least studied coastal ecosystem in Indonesia, compared to mangrove forests and coral reefs (Basyuni et al., 2022). According to Rustam et al. (2019), Indonesia has 13 out of 69 species of seagrass found in the world (Figure 8).



**Figure 8. Examples of seagrass species found in Indonesia: *Cymodocea hemprichii* – smooth ribbon seagrass (top left), *Thalassia rotundata* – sickle seagrass (top right), *Halophila ovalis* – hairy spoon seagrass (bottom left), *Halodule uninervis* – needle seagrass (bottom right) (Ria Tan, 2010)**

### **3.1.3. Coral Reefs**

Ayyam et al. (2019) explained that corals are "two-layered, tiny invertebrate animals called polyps that live in groups and are related to jellyfish and sea anemones", whereas coral reefs are the limestone structures formed by reef-forming (hermatypic) corals. Coral reef ecosystems are among the most productive and biologically diverse ecosystems on the planet (Odum & Odum, 1955). They can be found in shallow waters to the extent of sunlight penetration (Ayyam et al., 2019). They provide commodities and services to a large number of people, such as seafood, recreational opportunities, coastal protection and aesthetics, and cultural benefits (Moberg & Folke, 1999). Being the most biologically productive ecosystems, coral reefs offer excellent fishing potential. Nine million tons of fish are brought in annually from the coral reef environment out of the 100 million tons of fisheries produced worldwide (Munro, 1984; Smith, 1978). Other than that, coral reefs protect the coast and islands. Even in some places, islands are formed over coral beds.





Figure 9. Coral reefs in Indonesia (Burhan Herjah, 2020; Fakhrizal Setiawan, 2009)

In terms of coral reef biodiversity, Indonesia is one of the six countries in the South-East Asian Coral Triangle region (Glaser et al., 2015). The Coral Triangle (CT) region is deemed the “nursery of the seas” by WWF, where it is “the most diverse marine region on the planet, covering some 6 million km<sup>2</sup> of oceans across six countries in the Asia-Pacific region”. Also called the “Amazon of the Seas”, the coral triangle encompasses several sea zones that touch the seas of Indonesia, Malaysia, the Philippines, East Timor, Papua New Guinea, and the Solomon Islands (Rafferty, 2013). There are roughly 570 species and 83 genera of stony corals recorded in Indonesia, representing approximately 69% of all species and 76% of all hard corals worldwide (LIPI, 2019).

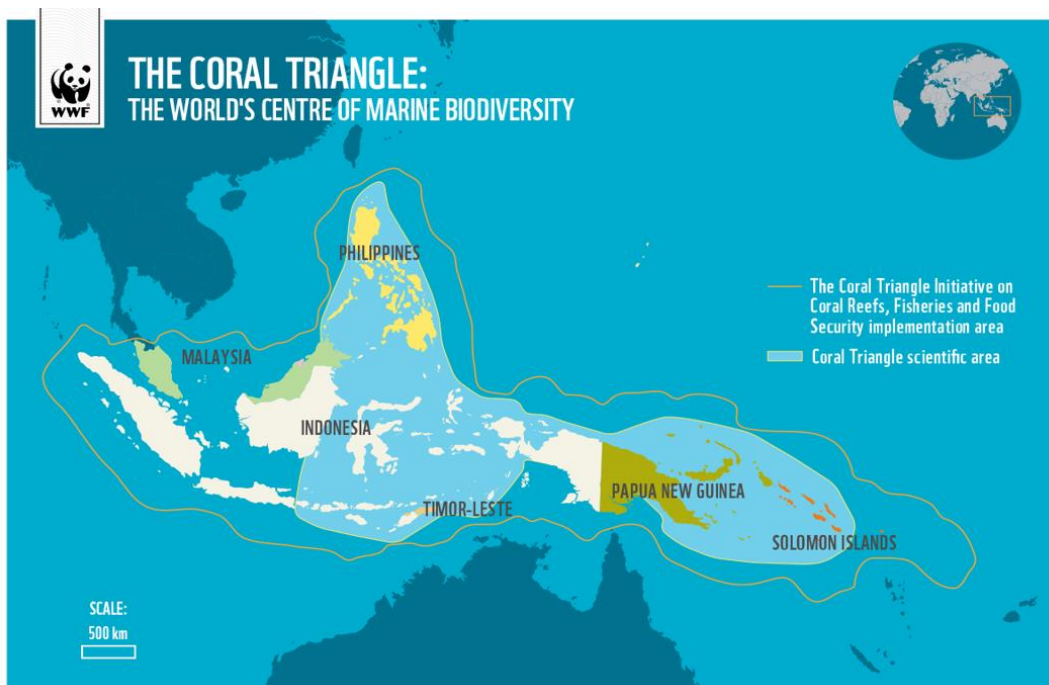


Figure 10. A map showing the area within the Coral Triangle initiative (WWF)

### **3.2. The Interconnectivity of Tropical Coastal Habitats**

How do those three ecosystems connect with each other? Mangrove forests, seagrass meadows, coral reefs, and other nearshore ecosystems are highly connected because they are physically and biologically dependent on each other (Nagelkerken et al., 2000). However, according to Kathiresan and Alikunhi (2011), this connectivity is not adequately understood for better management practices. The focus of research in ecology has shifted over the past three decades – from the biomass levels of various groups of creatures to the interactions between them, leading to an ecosystem being seen as a system of interactions (Fasham, 1984).

Coral reefs alone have been long known for hosting approximately 25% of marine species (Plaisance et al., 2011), and the high level of mean productivity rivals those of terrestrial ecosystems. Coral reefs not only protect coastlines, but they also sustain fisheries and play a significant role in the tourism industry (Stone, 2007; Khan and Larrossa, 2008 in Earp et al., 2018). Mangroves aid in stabilizing coastlines and prevent erosion (TNC, 2020) as well as trap and store an extensive amount of carbon dioxide emissions and other GHGs into their carbon-rich flooded soils. On the other hand, seagrass meadows act as an important link between land and sea, which helps improve water quality and protect shorelines (MacDonald, 2018).

Although mangroves, seagrass, and coral reefs may all protect coastlines on their own, Guannel et al. (2016) stated that having all three of them together can offer greater protection than having either one ecosystem individually or any combination of two ecosystems. This demonstrates that these ecosystems cooperate with one another, and the well-being of one ecosystem is directly linked to that of the others. Jeopardizing the health of either one of these ecosystems will inevitably have a knock-on effect on the health of the others (Grober-Dunsmore et al., 2009).

The well-being of marine and coastal ecosystems depends highly on nearshore terrestrial environments (Figure 11). Land use changes, such as deforestation or conversion of vegetated land, can increase sedimentation and pollution in mangrove forests, seagrass meadows, and coral reef habitats (Fabricius, 2005; McCulloch et al., 2003). Furthermore, changes in land environments also affect how rivers flow – disrupting the freshwater input needed for growth of mangroves and changing the amount and timing of discharge from freshwater to coastal systems (Ellison & Farnsworth, 2001). Ellison & Farnsworth also stated that changes in upland hydrology, such as dam construction, can have cascading effects on mangroves, seagrass, and coral reef ecosystems.

Tropical marine ecosystems have been observed to have the ability to withstand periodic disturbances to their ecological equilibrium or “steady-state”, recover, and quickly

regenerate (Connell, 1997). However, since human activities in the approximate area of coastlines have increased considerably over the past few decades, relatively more prolonged, extensive, and intense new disturbances began to emerge. These kinds of disturbances cause significant difficulties for tropical marine ecosystems to keep up their cross-ecosystem interactions.

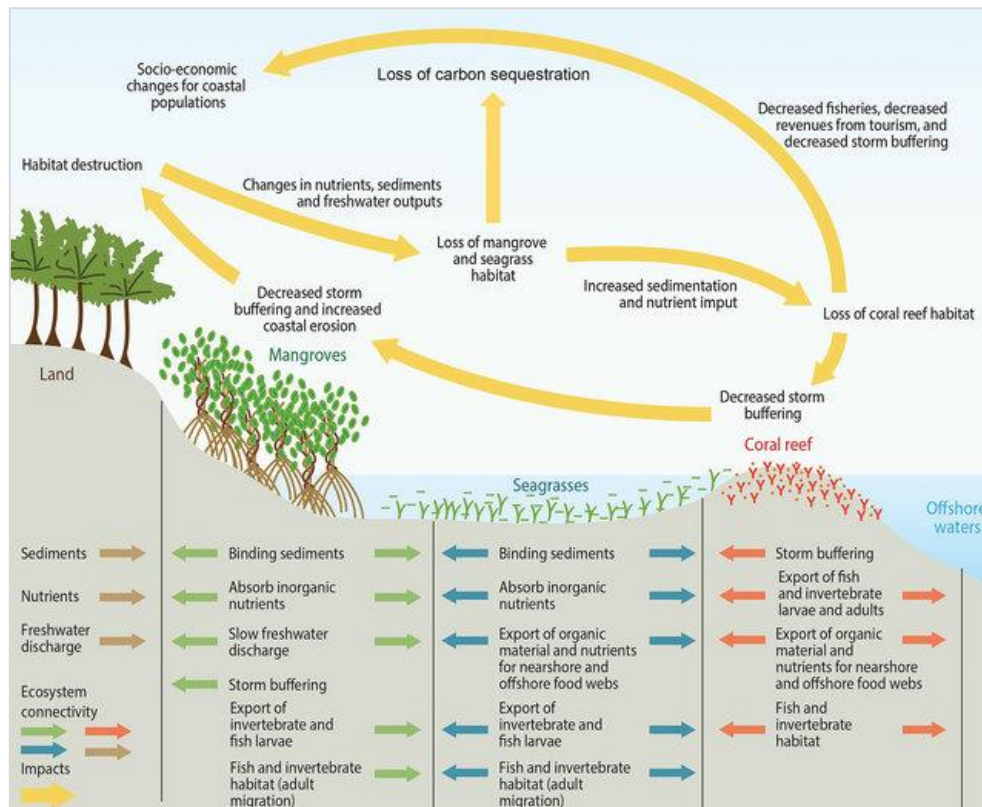


Figure 11. Interconnectivity between mangroves, seagrass, and coral reef ecosystems (Silvestri & Kershaw, 2010)

### 3.3. Marine and Coastal Ecosystem Services

As discussed previously, coastal and marine ecosystems in general give significant contribution to the livelihoods of coastal populations. This is related to the concept of “ecosystems services”. The Millennium Ecosystem Assessment (MEA) defined ecosystem services (ES) as the benefits provided to humans by ecosystems – with the assumptions that these ES contributes to the human well-being (Barbier, 2017; Mahajan & Daw, 2016). In general, services provided by ecosystems include provisioning services such as food and water, regulating services such as flood, drought, erosion, land degradation, and disease regulations, supporting services such as soil formation and nutrient cycling, and cultural services such as leisure, spiritual, religious, and other non-material benefits (MEA, 2005). For marine and coastal ecosystems, MEA identified a number of common services;

food, biodiversity, nutrient cycling and fertility, climate regulation, disease control, flood and storm protection and cultural assets (in Silvestri & Kershaw, 2010). These services usually rely on ecological pathways connecting coastal systems – estuaries, intertidal areas, lagoons, kelp forests, mangroves, rock and shell reefs, seagrass meadows, and coral reefs – with the open ocean or the mainland (Silvestri & Kershaw, 2010). Liqueete et al. (2013) summarized and discussed the marine and coastal ecosystem services, which are then compiled in Table 3 below.

**Table 3. Categories and description of the integrated classification of marine and coastal ecosystem services (Liquete et al., 2013)**

	<b>MCES</b>	<b>MARINE/ COASTAL SPECIFIC COMPONENT</b>
<b>PROVISIONING</b>	Food provision	<ul style="list-style-type: none"> <li>• Fishing activities (including shell fishing) – industrial or artisanal (either commercial or subsistence fishing).</li> <li>• Aquaculture – the farming of aquatic organisms, including fish, crustaceans, mollusks, seaweeds, and algae.</li> </ul>
	Water storage and provision	<ul style="list-style-type: none"> <li>• Water abstraction – mostly associated to coastal lakes, deltaic aquifers, or desalination plants.</li> <li>• Marine water used for industrial cooling processes or coastal aquaculture in ponds and raceways.</li> </ul>
	Biotic materials and biofuels	<ul style="list-style-type: none"> <li>• This includes medicinal (e.g., drugs, cosmetics), ornamental (e.g., corals, shells) and other commercial or industrial resources (e.g., whale oil, fishmeal, seal leather, algal or plant fertilizers).</li> <li>• Biomass to produce energy can have a solid form (like wood from mangroves), liquid (like fuels extracted from algal lipids or whale oil) or biogas (from decomposing material).</li> </ul>
<b>REGULATING &amp; SUPPORTING</b>	Water purification	<ul style="list-style-type: none"> <li>• Treatment of human wastes (e.g., nitrogen retention); dilution; sedimentation, trapping or sequestration (e.g., of pesticide residues or industrial pollution); bioremediation (e.g., bioaugmentation after marine oil spills); oxygenation of “dead zones”; filtration and absorption; remineralization; decomposition.</li> </ul>
	Air quality regulation	<ul style="list-style-type: none"> <li>• Vegetation (e.g., in mangroves), soil (e.g., in wetlands) and water bodies (e.g., open ocean), due to their physical structure and microbiological composition, absorb air pollutants like particulate matter, ozone or Sulphur dioxide.</li> </ul>
	Coastal protection	<ul style="list-style-type: none"> <li>• Natural defense of the coastal zone against inundation and erosion from waves, storms or sea level rise. Biogenic and geologic structures that form the coastal habitats can disrupt the water movement and, thus, stabilize sediments or create buffering protective zones</li> </ul>
	Climate regulation	<ul style="list-style-type: none"> <li>• The ocean acts as a sink (and only a very marginal source) for greenhouse and climate active gases. Inorganic carbon is dissolved into the seawater, organic carbon is formed through primary producers, a percentage of which is stored, and a percentage of which is sequestered.</li> </ul>
	Weather regulation	<ul style="list-style-type: none"> <li>• For example, the influence of coastal vegetation and wetlands on air moisture and, eventually, on the saturation point and the formation of clouds</li> </ul>

	Ocean nourishment	<ul style="list-style-type: none"> <li>Natural cycling processes leading to the availability of nutrients in the seawater for the production of organic matter. Pedogenesis could be observed at the margin of certain wetlands and mangroves, depending on hydrodynamic conditions.</li> </ul>
	Life cycle maintenance	<ul style="list-style-type: none"> <li>The maintenance of key habitats that act as nurseries, spawning areas or migratory routes (e.g., seagrasses, coastal wetlands, coral reefs, mangroves). These habitats and the connectivity among them are crucial for the successful life cycle of species. This also includes pollination (e.g., mangrove pollination), and seed and gamete dispersal by organisms. This service guarantees the maintenance of genetic diversity or gene pool protection.</li> </ul>
	Biological regulation	<ul style="list-style-type: none"> <li>Control of fish pathogens especially in aquaculture installations; role of cleaner fishes in coral reefs; biological control on the spread of vector borne human diseases; control of potentially invasive species.</li> </ul>
<b>CULTURAL SERVICES</b>	Symbolic and aesthetic values	<ul style="list-style-type: none"> <li>Coastal communities have always shown strong bonds to the sea due to the local identity. Natural and cultural sites linked to traditions and religion are numerous in the coastal zone. Both coastal and inland societies value the existence and beauty of charismatic habitats and species such as coral reefs or marine mammals.</li> </ul>
	Recreation and tourism	<ul style="list-style-type: none"> <li>The appeal of marine ecosystems is usually linked to wilderness, sports, or iconic landscapes and species. It can be related to coastal activities (e.g., bathing, sunbathing, snorkeling, scuba diving) and offshore activities (e.g., sailing, recreational fishing, whale watching).</li> </ul>
	Cognitive effects	<ul style="list-style-type: none"> <li>Inspiration for arts and applications (e.g., architecture designs inspired in marine shells, medical applications replicating marine organic compounds). Material for research and education (e.g., discoveries of new deep-sea species). Information and awareness (e.g., respect for nature through the observation of marine wild life).</li> </ul>

## CHAPTER 4:

# STUDY SITE

---

In this chapter, I will first provide an introduction to the location that I took as my research site. I will briefly explain the history of Karimunjawa National Park (KNP), as well as a bit about the zoning system implemented by the Indonesian government and Karimunjawa National Park Authority (KNPA), which is a key practice in national park management in Indonesia. I explain this here because it will be relevant later with the discussions presented in Chapter 6. Additionally, I will also present some previous studies related to co-management and participatory management in KNP to show that community involvement in national park management in Karimunjawa has been a frequent topic for research for several years.

### 4.1. Introduction to the Study Site

The Karimunjawa Islands is a tiny group of islands in the Java Sea to the northwest of Jepara Regency in Central Java, Indonesia, and located just 120 km north of Semarang, Central Java's provincial capital. The tiny archipelago consists of 27 coral reef-fringed islands (Figure 12) and have a population of approximately 9000 people (Campbell et al., 2013). Although the whole Karimunjawa Islands encompasses 27 islands, the Karimunjawa National Park (KNP) only consists of 22 islands. Out of all the 27 islands within the archipelago, only five islands are being inhabited by people from various Indonesian ethnic groups. According to Hafsaridewi et al. (2018), around 47% of the working population in Karimunjawa Islands are fishermen, while the others work as farmers, industrial workers, construction workers, civil servants, merchants, and other occupations. KNP encompasses four villages: Parang Village, Nyamuk Village, Kemujan Village, and Karimunjawa Village, which will be the only village taken as the focus in this study. The marine biodiversity of Karimunjawa and its pristine forests have been attracting numerous researchers, since it hosts rich diversity of species (Edinger et al., 2000). KNP is one of the top three most threatened marine parks in Indonesia due to local pressures such as fishing, aquaculture, and tourism (Kennedy et al., 2020).

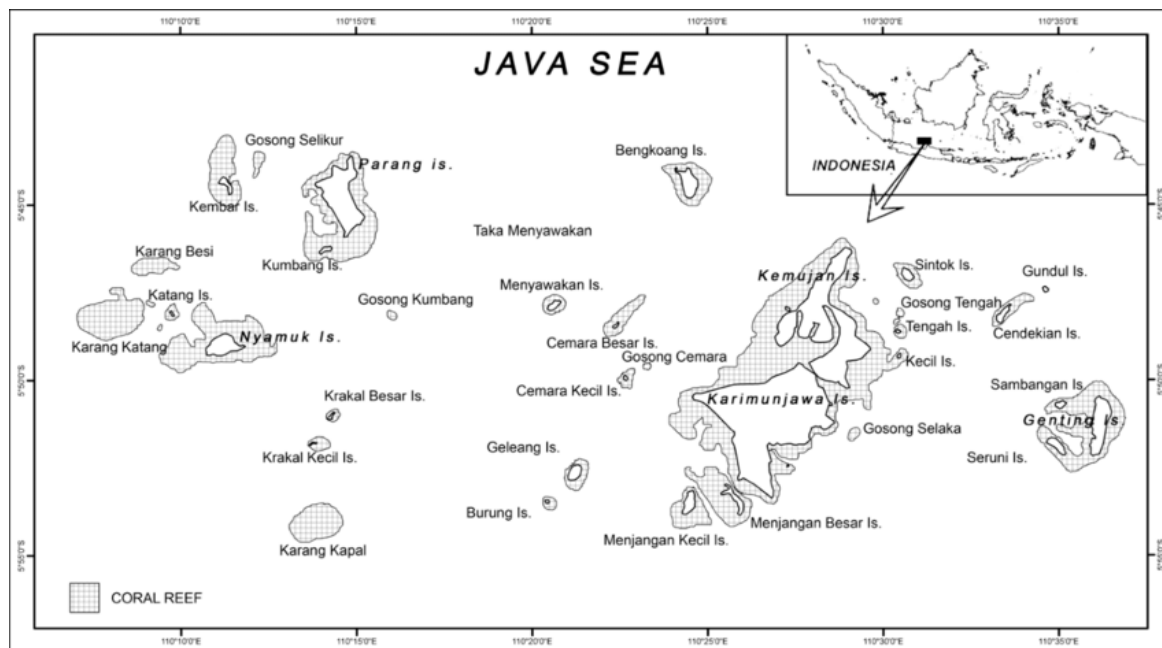


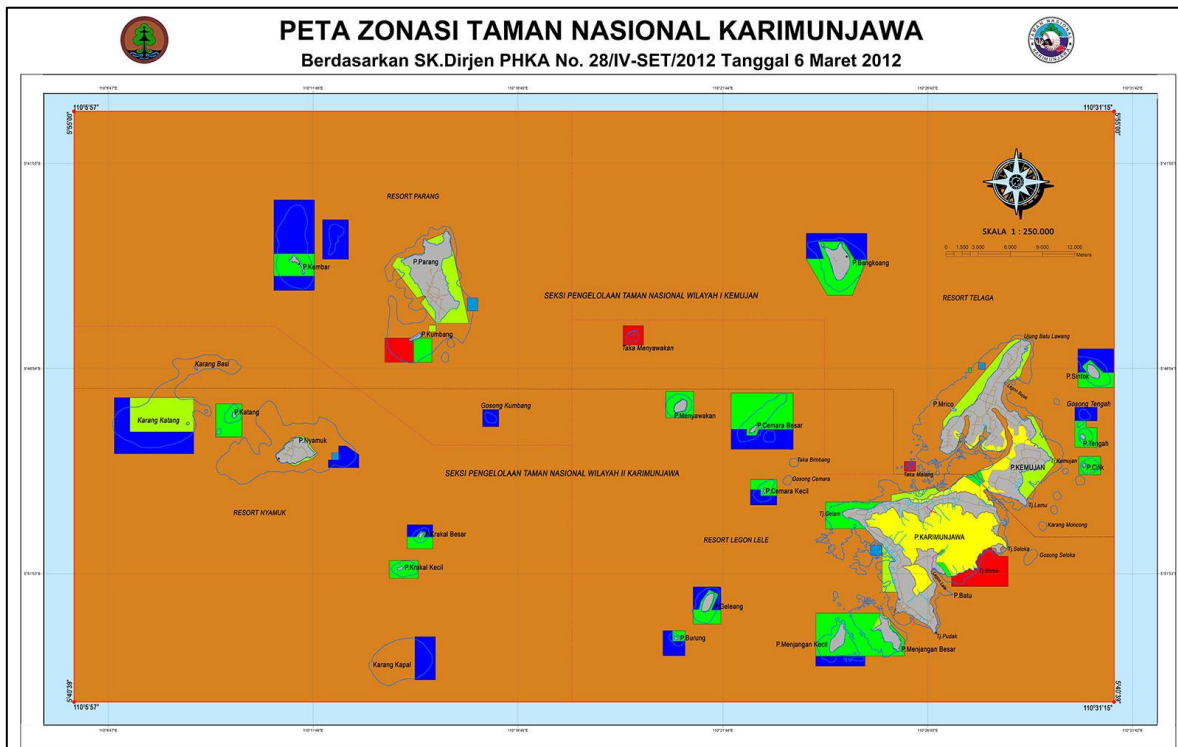
Figure 12. Map of Karimunjawa Islands, with coral reef highlighted (Taruc, 2011)

#### 4.1.1. History of Designation and Zoning System

At first, Karimunjawa was initially designed as “Karimunjawa National Park and Marine Tourism Development Area” in 1982, which was stated in Letter of the Governor of Central Java No.556/21378. In 1986, the national park was then chosen to be referred to as “Karimunjawa Marine Nature Reserve” which was stated within the Minister of Forestry Decree No.123/Kpts-II/1986. In the beginning of 1988, however, the status then changed from marine nature reserve, back to national park, which was determined in the Statement Letter of the Minister of Forestry No.161/Menhut-II/1988.

A year after being designated as a national park, in 1989, the zoning system was then implemented, which consisted of the designation of four zones within the national park area: core zone, protection zone, utilization zone, and supporting zone. The zoning system has been a central practice of marine and coastal management in Karimunjawa National Park. This zonation was later changed in 2005, with the rationale being the necessity to solve management issues, particularly those involving ecological, socioeconomic, and cultural components, which resulted in overlapping policies in many sectors, either at the provincial or regency levels (Sugio, 2020). The re-zonation was conducted through a consultative approach, involving local communities (BTNK, 2012a). After the re-zonation, the national park had seven zones, which comprises of: core zone, protection zone, utilization zone, mariculture zone, rehabilitation zone, residential zone, and traditional fisheries zone. According to the Karimunjawa National Park Authority (KNPA) (BTNK, 2012b), there was another evaluation for the park’s zonation, and by 2012,

the national park was successfully re-zoned into nine zones Figure 13: core zone ■, wilderness zone ■, protection zone ■, terrestrial utilization zone ■, tourism utilization zone ■, mariculture utilization zone ■, rehabilitation zone ■, traditional fisheries zone ■, as well as religious, cultural, and historical zone ■.



**Figure 13. Zonation Map of Karimunjawa National Park (BTNK, 2012b)**

According to the Karimunjawa National Park Authority (KNPA), the 2005 zonation change was driven by flaws in national park management. Firstly, there was a lack of compliance to fishing regulations from the fishing community. This included the use of destructive fishing equipment and overfishing in particular areas of the national park. As a result, the KNPA and local communities teamed up through collaborative management to address the issues and build an effective fisheries policy (BTNK, 2004). Second, the limited involvement of local communities caused misunderstandings regarding management programs (BTNK, 2004). Sugio (2020) stated that this was because there was no proper introduction and socialization from the KNPA’s behalf to the local communities. Third, this lack of community involvement also caused failure in building awareness among the members, creating the impression that “conservation means prohibition”. Sugio also stated that with the increasing number of tourists at that time, traditional culture and norms was slowly replaced by foreign habits. Additionally, there is also and increasing competition between tourism entrepreneurs and the local communities.



As for the 2012 revision, Sugio (2020) stated that between 2005 and 2009, there was an indication of changes in ecological and socio-economic conditions in Karimunjawa National Park (KNP). First, it was related to the decrease in marine catch which was caused mainly by marine resource degradation. There was also a decrease in coral reef population due to overexploitation and the use of destructive fishing methods such as trawlers and spearguns. During this time, though, there was a decrease in the use of potassium cyanide in reef-fishing. Second, although there was an increase of the local community's understanding regarding the zonation for national park management, it does not affect the compliancy towards regulations (Sugio, 2020). This was mainly because the areas that were transformed into core zones and protection zones were also the areas where fishermen usually catch most of their fish (BTNK, 2012a). Third, there was an overexpansion of mariculture, especially seaweed farms. The government, along with the Wildlife Conservation Society (WCS) highly supported seaweed farming, and because of this, most people in Kemujan Village changed occupations, from being fishermen to seaweed farmers. The problem was, the mariculture zone was only 788 hectares, while the seaweed farms grew to be around 1259 hectares (Sugio, 2020). Since most of the farms overflowed to the adjacent traditional fishing zones, the Karimunjawa National Park Authority (KNPA) grew concerned about the possibility that the farms can expand to the protection zone.

The fourth reason is related to the necessity to alter the tourism utilization area. Since Karimunjawa is one of the most popular tourism destinations in Indonesia, this area has become a target for tourism development. According to KNPA (BTNK, 2012a), there was a need to alter the boundaries of the mangrove forests and the tropical rainforests. The fifth reason is because there are some small islands within the KNP that were (or probably still are) owned by some members of the local community. Therefore, it was important to give attention to the accessibility of the owners. However, some parts of the islands owned by those people were within the core zone and protection zone, so at that time, whatever buildings or developments were forbidden by the KNPA. To solve this problem, the area surrounding these islands were transformed into tourism utilization area, so that people can easily access those islands.

The implementation of the zonation as a key pillar of national park management in Karimunjawa has led to studies being conducted to evaluate the effectiveness of the zoning system. The zoning system, which limits the activities of communities within a certain area, is closely related to the compliancy of local communities and their participation in management practices - the extent to which communities are willing to participate and comply with management when their activities are limited by these regulations. The next sub-section presents the studies related to community participation in complying with the

zoning system, as well as other studies related to community participation in natural resource management in general.

#### **4.1.2. Previous Studies on the Management Practices of Karimunjawa National Park**

In relation to the zoning system implemented in Karimunjawa National Park (KNP), a study by Wibowo et al. (2017) was conducted to measure the level of participation of local communities in KNP. The results of the study stated that local communities, especially fishing communities, have good knowledge and understanding of KNP management decisions and practices. This was demonstrated through a series of perception surveys that showed that there was a high level of knowledge and compliance from the fishers in terms of adherence to fishing regulations. However, the community felt that the zoning regulations were slightly unfair, as there was an overlap between their fishing areas and the protection zone. Wibowo et al. concluded that there should be higher socialization and communication to fishing communities regarding the zoning regulations. The community should also be more involved in the decision-making process, so that when there are changes that need to be made, all parties can achieve the desired goals together.

In addition to studies on the zoning system and management practices in KNP, since 1998, several projects have been implemented in KNP to increase community engagement in natural resource conservation (Wibowo et al., 2017). These projects were and are primarily aimed at empowering communities through economic development, institutional strengthening, alternative livelihoods, and community capacity building. Other than that, KNP is also often used as a case study for collaborative management (Campbell et al., 2013; Purwanti, 2008). Several institutions and organizations had worked together with community members in surveillance, monitoring, and management implementation.

Purwanti (2008) in her dissertation titled "*The Concept of Karimunjawa National Park*", conceptualized the idea of co-management in Karimunjawa National Park. Her project was aimed to propose policy directions for the growth of co-management for a more integrated and sustainable KNP management, as well as to assess management policies and institutions within the management domain. KNPA's managerial capacity was also evaluated. Her study revealed that the regulatory substances inside the national park were focused on the centralization of authority by the central government, which produced a sense of "not owning" among members of the local government as well as members of the community. However, this demonstrated that conservation efforts in KNP were still weak in some areas, as seen by the large number of violations that occurred, including cyanide fishing and the poaching of protected biota. According to Purwanti, KNPA has formed partnerships with a number of institutions, including Diponegoro University in

Semarang, the Regional Office of Fisheries, and the World Wildlife Fund (WWF), to improve the effectiveness and capacity of park management. However, those partnerships could not be described as collaborations because there was no sharing of authority and responsibilities.

Campbell et al. (2013), in their research about incorporating incentive programs to improve management effectiveness in Karimunjawa National Park (KNP) stated that the most important findings was that economic assistance from the government, community, and non-governmental sectors is an important aspect in allowing livelihood to transition to sustainable fishing techniques, minimizing destructive fishing, and improving biodiversity conservation. The improved governance in KNP seems to match, at least in part, many of the design elements of governance that have been found to be important for successful local administration. For example, resource-dependent populations living within KNP were aware of the social and economic implications of new management revisions being developed in 2003 and accordingly self-organized and contributed through participatory planning processes to protect their diverse interests (for example, income, food security, or sense of place), and this directly influenced the final set of regulations passed by the government in 2005. The promotion of community participation in management processes that has resulted from this has increased the awareness of sanctions, clearly defined geographic boundaries, and improved rights to participate in the development of rules and regulations for fishing restrictions. All of these have helped to reduce conflict among coastal communities.

Rani et al. (2019) conducted a study that was aimed to understand the management practices in Karimunjawa that were exercised by stakeholders and the local community within the implementation of co-management. Rani et al. integrated "key conditions" to assess the management process, which involved defined management boundaries, defined membership within the co-management, group cohesion, existing organizations or institutions, benefits that outweighs costs, participation from relevant community members, the enforcement of management regulations, legal rights to management regulations, collaboration and leadership in the community level, decentralization and power delegation, as well as coordination between government agencies and communities. This assessment based on these key conditions was then followed by a "stakeholder analysis" to complete the evaluation. In their study, Rani et al. discovered that collaboration between actors in the academic and commercial sectors, as well as government and the local community, was required for successful co-management in Karimunjawa. They also emphasized that collaborative management can become an alternative in developing partnerships for the utilization of fisheries and marine resources towards sustainable development.

There are several other literatures on the co-management and community-based management in Karimunjawa (Magfiroh, 2020; Nugroho, 2014; Qodriyatun, 2018). Some of them are even directed for one particular sector that was more specific, such as ecotourism, sustainable fisheries, mangrove forestry, and several others. They suggested the idea of including local community engagement in the process of managing natural resources. The purpose of this engagement is to accomplish a regulatory system that is flexible enough to meet the expectations of all parties involved in order to reach a high level of compliance with the regulations that are in place. However, not one has tried to look at the social interdependencies of local communities based on the concept of ecosystem services. In actuality, interdependency is an important component that can be used to see how stakeholders communicate with each other and form a network of interactions that can encourage them to work together to organize collective actions.

## CHAPTER 5:

# RESEARCH METHODS

---

In this chapter, I will present the research approach that I have chosen for this study and the rationale for that. After that, I will explain my method of choice of how I chose the respondents or subjects for this study, and the list of groups or individuals whose responses I have managed to collect. The instruments that I have used to gather the information that I need will be explained after that, along with the ethical considerations that I had to take in order to protect the autonomy and privacy of the respondents. The data analysis will explain in detail how I organized and analyze the data. The last part will cover some reflections in regards to the validity, reliability, as well as the researcher's positionality within this study.

### 5.1. Research Approach

This study used a field research approach which was conducted for three weeks in October 2023 in Karimunjawa Village. According to Burgess (1984), field research is performed in a social situation where the researcher acts as a participant. The role of the researcher is to observe and record how people act and behave as they are. In this study, I intend to observe and record how in their lives, the local community of Karimunjawa Village perceive the benefits that they get from ecosystem services until they are finally able to put value on these ecosystem services. Burgess emphasizes that an important point to note in conducting field research is that researchers must be able to define their field of study in order to narrow down the focus of the research. This means that researchers must be able to continuously determine "where", "when", "what", and "who" to observe and interview.

I have outlined the "when", "where", and "what" components of the focus of this study. In terms of "who", the main subject of focus in this study is the local community of Karimunjawa Village who are actors within the three main sectors of the village: fisheries, tourism, and environmental protection. With this in mind, I had determined the respondents that I needed to interview to obtain the information I needed, such as fishermen, tour guides, as well as local people who participate in natural resource conservation, either as volunteers or white-collar workers.

## 5.2. Sampling of Research Subjects

The types of respondents for this study were pre-selected using the *purposive sampling* method, which means that they were picked on the basis of how well they fit in with the necessary data sources for this study (Naderifar et al., 2017). According to Etikan et al. (2015), in purposive sampling, the researcher decides on what need to be found and known, then they sets out to find people who are willing to provide information based on their knowledge or experience. Purposive sampling is frequently used on qualitative research to find and choose the information-rich cases so that the resources are used as effectively as possible (Patton, 2002, in Etikan et al., 2015). As I have noted in the previous section, I had already identified the respondents that I needed for this study, and they were a part of a group of fishermen, tour guides, and conservationists. The idea was to highlight the community groups that play a role in Karimunjawa's three main sectors and how they place value on ecosystem services.

When I arrived at the research location, the only contact that I had prepared prior to my arrival was for the head of the village. Although I had an idea of what kind of respondents I wanted to interview, I had no idea exactly on who to contact. In order to be able to get in contact with the respondents that I need, I used the *snowball sampling* method. This method is applied when it is difficult to access subjects with specific characteristics. The existing respondents would recruit possible respondents among their acquaintances, and the sampling continues until data saturation. (Naderifar et al., 2017). I explained to the head village of the study that I am conducting, and the specifications of the respondents that I needed, and from him, I obtained several contacts of possible respondents. I continued to recruit respondents from the referred respondents until I had the required number of participants to reach the ideal level of depth and richness of information. Coleman (1958, in Burgess, 1984) stated that this snowball sampling procedure follows the pattern of social relationships in a particular environment and therefore, the population in the sample drawn involves individuals and relationships between individuals.

The subjects of this study are members of the local community of Karimunjawa Village which include some members of fishermen unions, tour guide association, environmental protection actors (MMP – Community Partner for Forest Rangers, and local residents working for the WCS – Wildlife Conservation Society), the village head of Karimunjawa Village, as well as local residents working for the Karimunjawa National Park Authority. Table 4 below provides the rundown of the total number of people who were willing to be a part of this study's respondents.

**Table 4. Summary of the respondents**

<b>Group</b>	<b>Sample size</b>
1. Fishermen union #1	8 people
2. Fishermen union #2	3 people
3. Fishermen union #3	2 people
4. Tourist guide association (HPI Karimunjawa)	4 people
5. Local people working for WCS	2 people
6. Local community for forest rangers (MMP)	1 person
7. Head of Karimunjawa Village	1 person
8. Karimunjawa National Park Authority (KNPA)	2 people

### **5.3. Data Collection**

Data collection in this study was conducted through *in-depth interviews* with the respondents. According Crang and Cook (2007), interviewing has been a primary method by which ethnographic researchers have attempted to grasp the contexts and contents of different people's everyday social, cultural, political, and economic lives, in addition to participant observation. As Kitchin and Tate (2000) stated, interviews may be a valuable source of information about people's lives, ideas, aspirations, and sentiments. The data acquisition in this study used a combination of structured open-ended interview and informal conversational interview to gather information from conversations within and between various research communities.

During a *structured open-ended interview*, the researcher had a strong control over the conversations (Kitchin & Tate, 2000), and the questions were also structured and standardized through a set of guidelines. Instead of preparing questionnaires, I prepared a set of questions as a guideline on what to ask (the guideline is presented in the Appendices). The interview, however, did not consist of closed questions but rather of a series of open-ended ones, in which the respondents' replies are not limited to the categories typically offered by the interviewer who uses questionnaires, and that they were free to provide whatever answer they like. While the interview was *informal*, the topic was more concentrated. When the interviews were conducted, the members of the different groups were proven to be more willing to share their stories and point of views. This style allows respondents to talk about a topic inside their own "frame of reference," which allows for a more complete comprehension of the many points of view expressed by those who participated in the interviews (Kitchin & Tate, 2000).

As stated before, the interview was performed in a semi-structured manner, similar to a friendly conversation, in locations that the participants are most comfortable with (their personal homes, basecamp for their union/association, etc.). According Crang and

Cook (2007), participants that are questioned at a location and time that is convenient for them will be more comfortable to respond to questions in a more thorough manner. The majority of the fishermen asked to have the interviews conducted in the evening at their houses. This is because they typically fish in the sea from early in the morning until late in the afternoon. Only one group of fishermen invited me to the secretariat of their union. The leaders of the fishermen unions asked if they were allowed to invite some of their colleagues (within the same union) for the interview. This was beneficial for me, as this was easier than contacting each fisherman one by one. The tour guides were mostly like this as well. They were only available during the evenings, because from morning until the afternoon, they were at the sea taking guests on snorkeling, island-hopping, or even diving trips. I had the chance to interview some of them in the TIC (Tourist Information Center) near the docks where they would usually hang out after a long day at the sea. Although I did participate in two trips, they prefer to not be asked around on matters related to this study during this time so they can focus on the safety of the guests, as well as to keep the atmosphere "fun and exciting". During the trips, though, I had the opportunity to see how they performed their duties; how they socialized with the tourists and talked about Karimunjawa, what they could and could not do while snorkeling, and how they helped them stay away from the coral reefs and the sea urchins when they get too close, among other things. Unfortunately, during my stay in Karimunjawa Village for this study, there weren't any activities conducted by the communities or KNPA where I can come and observe, such as the release of sea turtles from the sanctuary to the sea, plantation of mangroves, and other conservation activities. In addition, with the research permit only valid for one month, I could not stay in Karimunjawa for too long.

#### **5.4. Data Analysis**

After the field work, data obtained from interviews, such as notes and voice recordings, were transcribed manually. Adhering to the ethical regulations, any information that includes personal data of individuals and groups will be removed to ensure anonymity. The data was then be processed qualitatively using ATLAS.ti, which is a qualitative data organizer that can be used to "label" or "code" the interview transcriptions, and see how these labels or codes correlate with each other. All of the transcription from the interviews were organized and labeled or coded using terms such as:

- "Seagrass", "Mangroves", and "Coral Reefs" to label all statements regarding how local communities value each of these ecosystems;
- "Provisioning ES", "Supporting ES", "Regulating ES", and "Cultural ES" to label the types of ecosystem services valued by local communities;



- "Conservation", "Tourism", and "Fisheries" to label all statements relating to the three main sectors in Karimunjawa;
- "Environmental Impacts" on statements regarding the implications of exploitation towards the three ecosystems;
- "Collective actions" to label statements regarding collective actions;
- "Collaboration" to label any indications that there any coordination among the three main sectors in Karimunjawa (fisheries, tourism, and environmental protection);
- "NP Regulations" to label all statements regarding national park regulations as well as local, regional, and even national regulations that have been implemented.

To answer the first research question (RQ1), I analyzed the transcriptions that had been made based on the voice recordings obtained during interviews with respondents. I tried to identify the commonalities of coastal ecosystem services that are received, used directly, and considered valuable by local communities. From these valued ecosystem services, I then tried to understand why local people value these services. For example, fishermen value coral reefs because they provide a source of food (fish) for the communities. It turns out that at the same time, conservationists also value coral reefs for the same reason. This pattern similarity is what I want to present in this study. From this, it can then be known what kind of ecosystem services are valued by who for what reasons.

For the second research question (RQ2), based on the ecosystem services that were already known when answering RQ1, I tried to see how members of the local community, which consists of co-producers, beneficiaries, and intermediaries in the distribution of ecosystem services, form a network of social interdependencies. In order to obtain this network of interdependencies, I used the social interdependencies framework developed by Barnaud et al. (2018) which is analyzed based on 4 components: cognitive framing of interdependencies, levels of organizations, institutions, and power relations. These interdependencies are based on empirical findings obtained from field work. So, I did not use this framework to "determine" the interdependencies among local actors, but to "present" or "map" the existing network of interdependencies found in real world to make it easier for me to identify the things that might create either conflicting or common interests within the local community. Other than that, I also used this framework to examine the power dynamics flow among actors.

To answer RQ3, I used the testimonies given by the respondents to see what kind of collective actions that had been implemented in Karimunjawa Village. With the help of the network of interdependencies that was illustrated based on Barnaud et al.'s framework, I then analyze the implementation of these collective actions - why did the actions happen the way they did? I also included other collective action that was implemented elsewhere

(specifically in a location that has different circumstances than Karimunjawa Village) as a comparison, to show that these different circumstances can drive collective action differently in one location and another.

### **5.5. Validity, Reliability, and Researcher's Positionality**

Validity relates to the suitability of values, tools, and techniques, as well as the research process, including data collection and validation (Mohamad et al., 2015). The most important thing in presenting data in qualitative research is its validity. When establishing validity, consensus between individuals and the community on how to determine the truth and accuracy of the research conducted is needed. When this consensus is considered, the methods and tools used when conducting research will be more likely to be accepted by the wider community. Thakur & Chetty (2020) point out that one method that can be used to ensure the validity and the reliability of a study is by triangulating the data. Triangulation means conducting research using multiple perspectives. For example, in this study, to ensure that the statements issued by the fishermen about the national park policy were true, I cross-checked with the KNPA and also with existing regulatory documents. Additionally, I also conducted a field observation on some aspects within this study to ensure that what I found based on the respondents' testimonies matched what I found in the field.

In regards to my positionality in this research, I position myself as an outsider. Because although I am Indonesian by nationality, just like all the respondents of this study, I do not reside anywhere near the coastal areas and nor am I a part of any coastal communities. Therefore, I have no prior understanding of how they live or how their activities affect the coastal environment. Nonetheless, I view this as an advantage because it allows me to report my findings objectively and take a neutral stance without taking any parties' side. But in qualitative research, total neutrality is not possible. Nevertheless, I made an effort to ensure that my final report truthfully reflected the perspectives of informants rather than being influenced by my own personal beliefs, educational background, and presumptions.

### **5.6. Ethical Consideration**

All of the interviews in this research were conducted with the consideration of the participant's willingness to participate. The fieldwork also took place when I had acquired permission from the Research Ethics Committee on Social Studies and Humanities,

Indonesian National Research and Innovation Agency (BRIN), and had submitted the data collection notification to the Norwegian Center for Research Data (NSD).

In every beginning of the interviews, the purpose of the study and the kind of information that I needed were explained to the respondents first, and with their consent, the interviews were documented through written notes and voice recordings. For this purpose, I have prepared a letter of consent beforehand. The letter of consent was actually one of several required documents that needs to be send out to the NSD, however, it turned out to be useful and practical to use during fieldwork. It helped the respondents to understand what they were "signing up for" by participating in this research. Information such as what kind of data that will be processed and inserted into the report (e.g., respondents' statements), the information that will be removed or kept, and the duration for the data being kept, are all written within the letter of consent. I have also added that the respondents are free to change their responses or even request for their responses to be omitted if they feel like their answers are inappropriate.

## **CHAPTER 6:**

# **RESULTS AND DISCUSSIONS**

---

This chapter will report the results that I have discovered through the fieldwork. These results will be presented in three parts, with each part attempting to answer each research question. The findings are being presented first as they are, followed directly by discussions related to the findings.

### **6.1. Value Placement on Coastal Ecosystem Services**

In this study, the perceptions of local actors regarding the coastal ecosystem services were gathered with the primary objective of finding the shared interests or the similarity of how each individual or group put value on these services. We understand that marine and coastal ecosystems provide benefits for the community living in the coastal areas. However, as discussed in the previous section, how individuals perceive these benefits provided to them depends greatly on many things, including how they use the resources available to them, their understanding on the functions of these resources, their beliefs, their interests in regards to these resources, among other things. The first part of this section will present how local people value ecosystem services. By putting value on those services, people are more eager to use the resources that provide these services, and by using these resources, there are impacts inflicted on them. The second part will present and discuss the impacts that are currently being borne by the coastal ecosystems in Karimunjawa, as the result of being valued by the local people.

#### **6.1.1. Value Placement on Coastal Ecosystem Services by Local Community**

Since different actors use coastal ecosystems differently, it is reasonable to assume that their perspectives on them are also different. An example for this is how fishermen may benefit directly from coral reefs, by how coral reefs provide various kinds of fish that fishermen can catch. On the other hand, fishermen may not directly receive any benefits from mangroves or seagrass. However, they do indirectly benefit from how mangroves and seagrass provide a place to spawn and nursing for the juvenile fish. At the same time, tourist guides may benefit from coral reefs and mangroves by attracting tourists, but not so much from seagrass. The differences in how they benefit and use resources may affect how different local actors perceive what resource is beneficial for them, and which are not. Based on the fieldwork that I have conducted, I have gathered the kinds of ecosystem

services that the local community have put value on, as well as who puts value on what, in Table 5 below.

**Table 5. Valued ecosystem services based on the perceptions of the respondents**

<b>Ecosystem Services Group</b>	<b>Valued Benefits</b>	<b>Mangroves</b>	<b>Seagrass</b>	<b>Coral Reefs</b>
Provisioning	Food is provided			F, C, T
	Livelihoods are provided			F, T
Supporting	Fisheries is supported	F, C, T	F, C, T	F, C, T
	Biodiversity is maintained	C, T	C, T	C, T
Cultural	Acquisition of knowledge is supported	C		C
	Leisure, recreation, and ecotourism	C		C, T
Regulating	Coastline is protected	F, C, T		C
	Other ecosystems are enhanced	C, T	C	

\* F (fishermen); C (conservationists); T (tour guides)

The valued benefits are summarized based on the respondents' answers. From this, they are then put into the group of ecosystem services (based on the groups suggested by MEA, 2003) which they belong; provisioning, supporting, cultural, or regulating services. The National Wildlife Federation (NWF, n.d.) has summarized the definition for each group of ecosystem services as follows: Provisioning services are any kind of benefits that people can extract from nature, such as food, drinking water, timber, wood fuel, natural gas, oils, and plants for clothing or medicine; Supporting services are the services that are necessary for the production of other ecosystem services. They sustain natural processes such as photosynthesis, nutrient cycling, soil formation, as well as sustain basic life forms through the provision of habitats; Regulating services refer to the benefits provided by ecosystem processes that regulate natural phenomena. This includes pollination, decomposition, water purification, erosion and flood control, climate regulation and carbon storage, as well as disease regulation; and Cultural services refer to the non-material benefit that contributes to the development and the cultural advancement of people, including the building of knowledge, ideas, creativity, and recreation. The letters F, C, and T refers to the group respondents: fishermen, conservationists, and tour guides, respectively. Initials of the group within a colored box means that during the interview, these groups mentioned to value the benefit stated within the "Valued benefits" column.

From Table 5, we can see what kinds of benefits that each group of respondents value. What I want to highlight here is that although all ecosystem services are ultimately beneficial to the community, it does not necessarily mean that these services are being

delivered to and beneficial for the members of the community in a uniform way. The value placement by local actors to these ecosystem services is highly influenced by the actors' knowledge of ecosystem services as well as whether or not the actors receive these ecosystem services directly. As presented in Table 5, conservationists place value on almost all valued ecosystem services that are listed. The conservationists understand that these services are valuable even though they don't actually benefit from all of them. This is because they are already equipped with relatively broad knowledge on ecosystems in general, including the production, flow, and the delivery of the benefits that these ecosystems provide. In contrast to this, the fishermen seem to only place value on the ecosystem services that they actually directly benefit from. They came to know and understand these services because they have experience on directly receiving them. To better understand what kinds of ecosystem services are being valued by the local community, I will elaborate more on this based on each coastal ecosystem that I am focusing on.

#### **a. On Mangrove Ecosystem**

When asked about what kind of benefits they receive from mangroves, most of the respondents' first answers were telling the story of the past. They said that in the past, mangroves used to have direct benefits. They used to be able to harvest mangrove timber for firewood and charcoal, since it was claimed that mangrove wood was able to retain fire very well. Not only that, local residents also used the timber from mangrove trees to build houses. However, since the establishment of the Karimunjawa National Park (KNP), wood harvesting from mangrove forests (specifically in areas within the KNP) has been forbidden. Some of the people claimed they also used to find mangrove fruits, but the trees did not yield enough fruits to fulfil market demand, therefore, the fruits were not considered as commodities since they could not satisfy local needs.

In current time, the mangrove forests in Karimunjawa, in particular the areas under the monitor of the KNP, is mainly used for research and leisure. The KNPA provided trekking paths within the forest, along with several huts that can act as posts, where people can stop for a while to rest or even take pictures in. The mangroves in the forest managed by the KNPA seem to be planted to form clusters based on each of their kind. Along the trekking path, there are numerous information boards showing what kind of mangroves are planted in that area, as well as what kinds of animals or flowers they can find within the forest, since the mangrove forest in Karimunjawa is home to a large diversity of insects, mammals, birds, and other kinds of flora. Through these information boards, people that walk along the trekking path can read and acquire knowledge on the

mangrove ecosystem in Karimunjawa. Aside from the forest that is being managed by KNPA, there are also several other mangrove forests that are privately owned.

Currently, for the respondents, mangroves appear to only provide more indirect benefits than direct ones. For example, fishermen understand that mangroves serve as a nursing ground for juvenile fish. The complex root system of mangroves provides protection for fish and other organisms from predators. Additionally, from the point of view of the conservationists, mangroves help in water filtration, so that sea water that has high level of salinity does not permeate into the ground and mix together with the groundwater. Water filtration also help to prevent pollution from the mainland does from flowing directly into the ocean. Furthermore, mangroves also play a role in protecting the coastline from waves so as to minimize the impact of abrasion, as well as become a barrier that protects the mainland from all kinds of coastal and marine disasters. Due to this protective role, mangroves ended up being called the “*coastal green shield*”. From the perspectives of the tour guides, mangroves also act as a supporter for the coral reefs, in a sense that organic nutrients originating from the fallen leaves of mangroves can encourage the growth of coral reefs. The summary for how the local community value mangrove ecosystem services is presented in Table 6 below:

**Table 6. Ecosystem services and the benefits they provide, as mentioned by the respondents**

<b>ECOSYSTEM SERVICES</b>	<b>BENEFITS RECEIVED</b>	<b>CHARACTERIZATION</b>
Supporting services	• Fisheries is supported	• A place to spawn and a nursing ground for juvenile fish.
	• Biodiversity is maintained	• Protection for organisms from predators. • Home for various kinds of birds, reptiles, insects, and mammals.
Cultural services	• Education	• A place where people can conduct research and studies.
	• Leisure, recreation, and ecotourism	• A trekking route within the mangrove forest.
Regulating services	• Coastal protection	• Preventing saltwater from making its way to the mainland. • Barrier to prevent erosion and abrasion by the ocean waters. • Barrier from natural disasters, such as tsunami.
	• Other ecosystems are enhanced	• Helps break down and recycle organic materials.

### **b. On Seagrass Ecosystem**

Similar to how they respond to the questions regarding mangroves, the first thing that the respondents do after being asked on what they think about seagrass is by telling stories from the past. In the past, respondents said that the local residents used to be

able to find sea grapes (*Caulerpa lentillifera*) in areas where seagrass grow. However, they did not elaborate more on how they benefit from those sea grapes. Other than that, sea cucumbers could also be found on the seagrass beds, but nowadays the fishermen stated that they are becoming harder to find.

In terms of the direct benefit of seagrass, all respondents answered by unequivocally saying that in current times, seagrass meadows do not provide any direct benefits, especially economic ones. Although it was known that seagrasses can be harvested and turned into food or medicine, the local residents of Karimunjawa do not use them for these purposes. However, the local residents are aware that seagrass meadows serve as important habitats for a variety of marine organisms, including as nursing grounds for reef fish, which are seen as valuable commodities.

*“Seagrasses are important because they are home for the fish to lay eggs, to spawn, and seek protection.”* – (Fishermen of Karimunjawa Village)

Due to their understanding of the indirect benefits of seagrass, especially in supporting the fisheries sector, the fishermen were able to express their concerns regarding the degradation of seagrass ecosystem in Karimunjawa, saying: *“If the seagrass is gone, the fish will be gone too”*. In addition to their responses, the fishermen also claimed that the areas where seagrass meadows can be found are mainly utilized by fish farmers to install fish farms (*tambak ikan* or *karamba* in Indonesian). According to them, fish farmers would release juvenile fish into the *karamba*, where they will be matured and harvested at the appropriate time.

From the conservationists’ point of view, other than providing habitats for marine organisms, seagrass also help in water filtration. When surface runoff flows from watersheds in the mainland towards the ocean, it is often laden with sediments and nutrients. Vegetated habitats, such as seagrass, help filter those sediments and nutrients, so that clear water can flow out to the ocean (Behesht, 2018). Water quality is important for marine environment, it affects not only one ecosystem but all coastal and marine ecosystems because of the connectivity that they have. Table 7 below provide the summary on the ecosystem services that the local community value.

**Table 7. Ecosystem services of seagrass and the benefits they provide, as mentioned by the respondents**

ECOSYSTEM SERVICES	BENEFITS RECEIVED	CHARACTERIZATION
Supporting services	<ul style="list-style-type: none"> <li>Fisheries is supported</li> </ul>	<ul style="list-style-type: none"> <li>A place to spawn and a nursing ground for juvenile reef fish.</li> <li>Supporting fish farms (<i>karamba</i>) operations.</li> </ul>



	<ul style="list-style-type: none"> <li>• Biodiversity is maintained</li> </ul>	<ul style="list-style-type: none"> <li>• Providing shelter for various kinds of organisms, including sea cucumbers.</li> <li>• Sea grapes can be found near where the seagrass beds are.</li> </ul>
Regulating services	<ul style="list-style-type: none"> <li>• Other ecosystems are enhanced</li> </ul>	<ul style="list-style-type: none"> <li>• Water filtration, helps filter sediments and nutrients so they do not reach the coral reefs.</li> </ul>

### c. On Coral Reef Ecosystem

The coral reef ecosystem can be considered as the “main attraction” in Karimunjawa Islands. It is the most attractive commodity that have managed to draw the attentions of hundreds or possibly even thousands of tourists each year.

*“Coral reefs are the main reason people come to Karimunjawa. Coral reefs are essentially what we are ‘selling’ here. This has to do with the fact that Karimunjawa is located in the northern coast of Java, we have beautiful coral reefs and high diversity of colorful reef fish. They’re attractive and wonderful to look at.”* – (Local tour guides)

In addition to that statement, the tour guides are aware that coral reefs provide a habitat for a wide variety of colorful reef fish, which is also an attraction in its own right. According to them, the clownfish is particularly popular among the tourists. During my snorkeling trips in Karimunjawa, I have the chance to see them in person, as well as sea cucumbers and sea urchins hidden among the coral reefs. Due to the enormous diversity of organisms the coral reefs are home to, they are referred to as “nature’s laboratory” by one of the conservationists. According to them, the coral reefs in Karimunjawa have been made subjects to the study of many researchers and scholars. Additionally, coral reefs have been claimed to provide the local communities with livelihoods, including tour guides and fishermen.

For the fishermen, coral reefs are home to a variety of highly-valued reef-fishes, including: parrotfish (Scaridae), rabbitfish (Siganidae), groupers (Serranidae), emperors (Lethrinidae), snappers (Lutjanidae), trevallies (Carangidae), fusiliers (Caesionidae), and even the napoleon fish or the napoleon wrasse/ humphead wrasse (Labridae). Due to the varying shapes of coral reefs, they are able to form complex clusters, thus providing shelter for a wide range of organisms. According to the conservationists, coral reefs act as breakers for ocean waves and currents coming from the deep seas, protecting the areas close to the coastline. Woodhead et al (2018) stated that coral reefs dissipate almost 97%

of the energy that would otherwise hit the shorelines. Table 8 below provides the summary of the ecosystems services that are being valued from the coral reef ecosystem:

**Table 8. Ecosystem services of coral reefs and the benefits they provide, as mentioned by the respondents**

<b>ECOSYSTEM SERVICES</b>	<b>BENEFITS RECEIVED</b>	<b>CHARACTERIZATION</b>
Provisioning services	• Fisheries	• Fish provide important nutrients for coastal communities
	• Opportunities	• Coral reefs provide diverse livelihood opportunities; e.g., fishers, guides, etc.
Supporting services	• Fisheries is supported	• Coral reefs provide a place for diverse organisms to forage and seek food
	• Biodiversity if maintained	• Protection for organisms from predators. • Home for various kinds organisms, fish, sea cucumbers, sea urchin, etc.
Cultural services	• Ecotourism	• Reef tourism, where tourists can snorkel and dive around the coral reefs.
Regulating services	• Coastal protection	• Breaker for ocean and waves coming from deeper waters. • Reduce damage from natural disasters.

### **6.1.2. How Value Placement on Ecosystem Services Lead to Ecosystem Degradation – The Case of Karimunjava Village**

As discussed in Figure 1 in sub-section 2.1.1, once ecosystem services are delivered and received by the users, users are then able to use these services through either appropriation or appreciation. The way users use these ecosystems ultimately affect the properties of the ecosystems. In some cases, even if they do not use these resources, there are also external factors that can still affect the existence of these ecosystems. This sub-section will present the issues that have been caused by the use of coastal ecosystems in Karimunjava, as well as other threats faced by them.

#### **a. Mangrove Ecosystem**

As discussed previously, for the people of Karimunjava Village, mangroves serve no direct benefits. Mangrove forests under the surveillance of KNPA can only be utilized for recreation and education, therefore, they cannot be extracted for public use. Even so, there are still many mangrove forests that are managed by individuals due to private ownership. Problems rise when people stopped using the materials extracted from mangrove trees. They do not need timber from mangroves to build houses anymore, people also do not need charcoal from mangroves to cook or keep their irons hot, and they also do not consume the fruits of mangrove trees. So then a question emerged: "what's the benefit of having a forest full of mangroves if they serve no purpose?" In cases like

this, mangroves are seen as “worthless” by the local residents, and because of this, many mangrove trees on privately-owned land are then cut down, so that the land can be used for something else. This is an example of land-use change that were experienced by some of the mangrove forests in Karimunjava Village.

During my time in Karimunjava, one of the most apparent land-use change on mangrove forests is shown by how they were converted into Vannamei shrimp farms (*tambak udang* in Indonesian – specifically for the *Litopenaeus vannamei* variant). According to the respondents, this land-use conversion was started around 2017. KNPA stated that a small number of these shrimp farms are owned by local residents. However, most of the others are owned by companies from outside of Karimunjava. Apparently, these owners use local residents’ land through a renting scheme, in which they basically receive access to use the land without having to buy it from the hands of the local residents. When inquired about this issue, the KNPA stated:

*“Shrimp farms? Not in the areas managed by the KNPA, but we already said ‘no’ since the beginning. Some of them have been approved by the government, some of them don’t even have the permits to operate.*

According to the KNPA and the local residents, the development of these shrimp farms has brought many problems to the environment and to local communities.

For the environment, the loss of mangrove forests means the loss of ecological functions provided by mangrove forests. The water filtration function of the mangroves in Karimunjava has not been working as well as it should, which has then caused juvenile fish not to have a place to spawn and shelter. Other than that, the protection role provided by mangrove forests to prevent natural disasters from hitting the mainland has also been decreasing significantly. This loss of ecological function surely has a direct impact on the connectivity and interdependencies between the mangrove ecosystem and the other ecosystems. With the increasing number of shrimp farms built on these mangrove forests, the amount of liquid waste these farms have been producing has been increasing as well. With the unavailability of mangroves to filter the waste, water quality around Karimunjava Village has been decreasing significantly, which in turn impacts the health of coastal ecosystems and various coastal organisms.

According to some local community members, the oversight of the establishment of these shrimp farms has caused a misunderstanding and a loss of respect for the KNPA. For years, the local community members have always been educated and encouraged to protect mangrove forests. But then, at the beginning of 2017, several hectares of mangrove forests were cut down and converted into shrimp farms. Because of this, the

community assumed that the KNPA permitted this conversion. So in a way, the community feels betrayed, although the mangrove forests that were cut down were not under the jurisdiction of the KNPA. In addition to that, regarding environmental impacts, the respondents also claimed that people have been complaining that the pollution caused by these shrimp farms has been causing the water to become murky, making people itchy.

#### **b. Seagrass Ecosystem**

As discussed previously, since seagrasses serve no direct benefits for the local residents, they do not experience overexploitation. However, another problem has been causing the decline in the condition of the seagrass ecosystem in Karimunjawa. The Vannamei shrimp farms that I have mentioned previously are speculated to have some contributions in the seagrass ecosystem degradation, especially through the inappropriate disposal of the waste into the sea. Sea cucumbers that the local community could easily find in the past, as well as the sea grapes that used to be bright green and clear, have been significantly affected by the shrimp farms' waste. The sea cucumbers have been disappearing from the shallow waters, and the sea grapes are now dark and slimy because they are coated with chemicals from farm waste. Although the shrimp farms were built on the mainland, the pipes for the waste are extended far into the sea, which affects not only the mangrove ecosystem but also the seagrass and coral reef ecosystems.

#### **c. Coral Reef Ecosystem**

The respondents consider the coral reef ecosystem to be the most valuable to them compared to the other two ecosystems. This is due to the ability of coral reefs to provide direct benefits through food provision. In my previous discussion, I have mentioned that the valuing of services will result in the appropriation or appreciation of the ecosystems that produce them. Because of the high value placed upon them by the local community, many coral reefs have been damaged or bleached due to the use of destructive fishing methods and increased tourism activities. The presence of shrimp farms in Karimunjawa also adds to the level of degradation of the coral reef ecosystem.

In regards to the increasing intensity of tourism in Karimunjawa, Karimunjawa has been a favorite destination for tourism since around 2010. The number of tourists coming to Karimunjawa has been increasing from year to year. Increasing number of visitors means increasing trips and tour packages that can be offered to them. This includes island-hopping trips, snorkeling trips, and diving trips, which has contributed significantly to the degradation of the coral reef ecosystem. In addition to that, the increasing number of people coming to Karimunjawa has also resulted in the increasing amount of food that

must be provided to meet the visitors' needs. Because of this, fishermen have been striving to increase their daily catch, causing increased competition among local fishermen. This competition ends up driving some of them to use destructive fishing methods so that they can catch as many fish as possible for as much profit as possible. Regarding this, KNPA and the conservationists stated:

*“Now that the demand for fish is increasing, fishermen have been catching even the kinds of fish that weren't originally targeted by them. Tourists don't know much about fish; as long as it's fish, they'll eat it. Local people may not even eat that kind of fish, but tourists don't care about that.”*

KNPA added that although the majority of reef fishes that are being targeted by the fishermen are not “in protection”, they are actually the kinds of fish that act as indicators for the health of coral reefs, so their existence and number in nature is very important. The fishermen themselves have claimed that there has been a stock decline of reef fish due to overfishing. Despite that, some of the fishermen still conduct in destructive fishing methods such as using speargun and potassium cyanide.

Spearfishing is considered damaging to coral reefs because the likelihood of spearfishers making contact with coral reefs is exceptionally high, which can cause physical damage to coral reefs. According to Frisch et al. (2012), breath-hold spearfishing is usually done in shallow waters, and usually target keystone species such as the parrotfish, which has an important role in maintaining reef health. Because of its effectiveness in shallow waters, spearfishing contributes significantly in the declining fish stocks in Karimunjawa.

In terms of the use of potassium cyanide in fishing, one fisherman who also works as a collector stated that the price for live fish and dead fish is different, where live fish is being priced more than the dead ones. Because of this, potassium cyanide became frequently used among fishermen. Potassium cyanide is basically used to “sedate” a fish, which means that by the time the fishermen catch it, this fish is still alive. When using potassium cyanide in shallow waters, fishermen would free-dive and squirt some of the liquid onto a group of fish near the coral reefs using a squirt bottle. Whereas in deeper waters, fishermen would often use compressors to spray the liquid. When sprayed on coral reefs, potassium cyanide can lead to rapid coral bleaching since it inhibits the photosynthetic activity within the corals (Johnson, 2021). The fishermen stated that cyanide-fishing and spear-fishing have both been forbidden to use within the Karimunjawa National Park area. However, because there is a weak surveillance, there are still many non-compliant fishermen.

Other than destructive fishing practices, pollution has become another factor that contributes to coral reef degradation. Apparently, according to some fishermen, the waste pipes that are coming from the Vannamei shrimp farms have been extended even further towards the ocean, making them even closer to where the coral reefs are. There have been several press releases regarding how bad the pollution caused by shrimp farm waste has been affecting the environment. In one of the releases (article by Nafiyanti, 2022), the head of KNPA at that time explained that chemical waste from these shrimp farms is rich with organic materials that nourish algae growth. Fleshy algae living in these corals release a massive amount of dissolved organic carbon which are digested by microbes (National Science Foundation, 2016). Too many microbes endanger corals by depleting oxygen or by releasing diseases. Until now, the local community has been pressuring the KNPA, as well as the government, to take action against the unethical practices conducted by these farms.

### **6.1.3. Summary**

This first section of this sub-chapter explores what and how ecosystem services are valued by the local community in Karimunjawa Village, and what basis they place this value on. It seems that how local people put value on ecosystem services is influenced by several things, including their knowledge of ecosystem services, as well as how they perceive the benefits that they receive from those services. The second part shows that ecosystems appear to be able to be impacted in some ways regardless of whether people consider ecosystem services (and the ecosystems themselves) to be useful or not. When the local community see these ecosystems and their services as valuable, these ecosystems will be appropriated until it reaches the point of depletion due to utilization beyond their capacity to fulfil society's needs. Unless their use is being appropriately regulated to prevent degradation from happening. On the other hand, if they are deemed useless, some areas (or even the whole area) of these ecosystems will be replaced with other environments that can serve them better services, for example through land-use change. In the next section, I will discuss how these two issues affect how local actors put themselves in community-based collective actions that are aimed for better management and a more sustainable use of coastal ecosystems.

## **6.2. How Does Value Placement on Ecosystem Services Shape the Social-Interdependencies Among Local Actors?**

Schröter et al. (2019) stated that when an ecosystem service is seen as valuable, society will express interests and work together to appropriate the ecosystem that

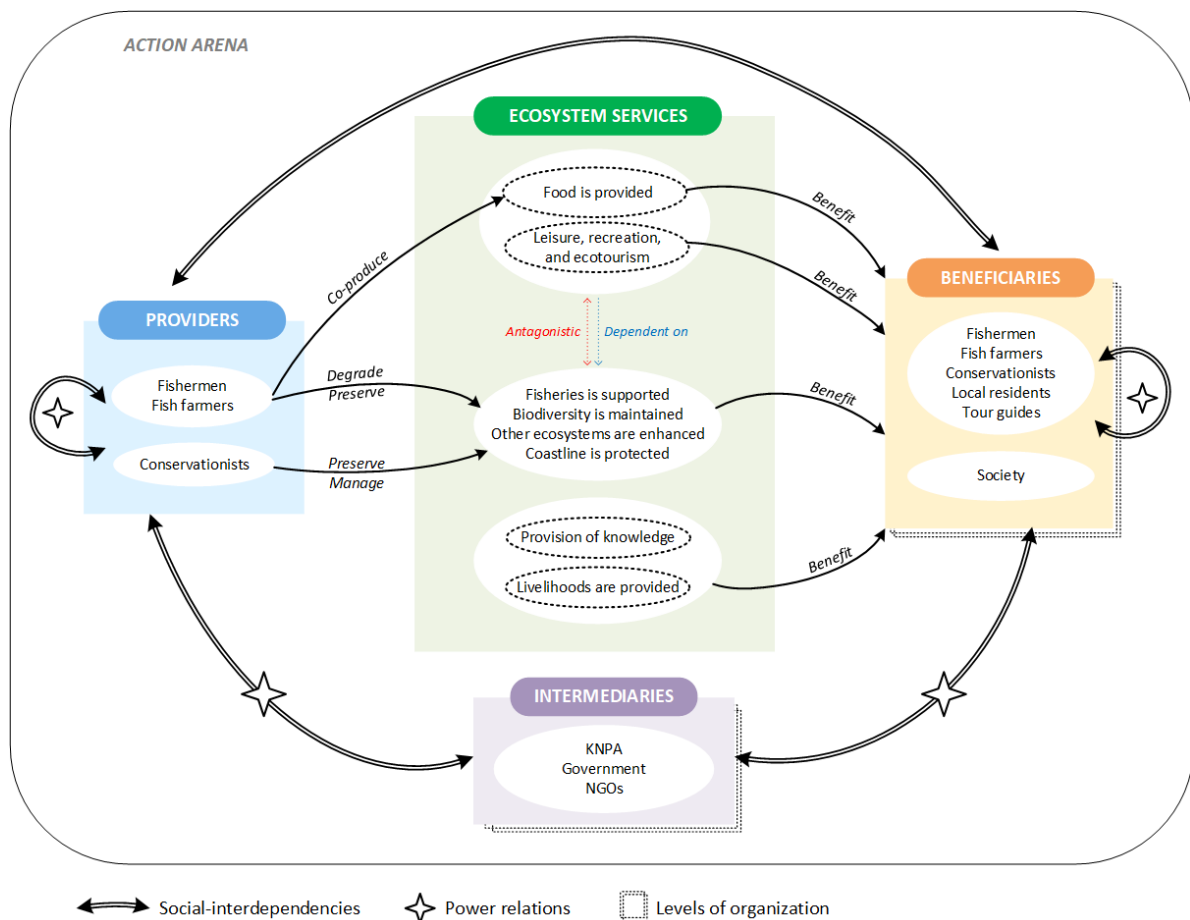
provides that service. In the previous section, I have presented the impacts of local people's appropriation on Karimunjawa's ecosystems, and according to the respondents, even they are aware of these impacts. The benefits they get from ecosystem services are reduced, and this is due to the declining quality of the properties of these ecosystems that causes them not to function optimally. Regarding this, Schröter et al. (2019) also stated that with the use of a resource, people would form a management system to regulate the use and acquisition of the ecosystem services that this resource provides. Grêt-Regamey et al. (2017) added that the concept of ecosystem services is now being widely incorporated into local management spheres. However, the challenge in using this concept is how to make it operationalizable and easily understood by local stakeholders to support more sustainable social-ecological systems (SES) management (Barnaud et al., 2018). A multiscale SES requires polycentric governance, which relies not only on markets and state-based management mechanisms, but also on collective actions that involve local stakeholders. The problem with this is that collective-based ecosystem service governance has rarely been explored (Muradian et al., 2010; Stallman, 2011; Muradian, 2013; Kerr et al., 2014; in Barnaud et al., 2018). Barnaud et al. (2018) have developed a framework to look into the interdependencies of various stakeholders related to ecosystem services, and how these interdependencies can create collective action. In the next sub-section, I will first elaborate the social interdependencies that exist among the Karimunjawa community using the framework created by Barnaud et al.

### **6.2.1. Social Interdependencies Among Local Actors in Karimunjawa Village**

The social interdependencies analysis framework developed by Barnaud et al. (2018) was actually created to look at the dynamics of dependency of actors in the agrarian socio-ecological system (SES). In this study, I tried to use the same framework to look at the interdependencies that exist in the Karimunjawa coastal community. From the use of this framework, a diagram of the social-interdependencies of coastal communities in Karimunjawa was obtained, which is presented in Figure 14.

In developing this social-interdependencies framework, the first thing that was identified was the ecosystem services that the local community considers important. These ecosystem services are the ones that I had identified and discussed in the previous section. They are then put into the panel in the center of Figure 14. There are three spheres within this ecosystem services panel. The first sphere contains ecosystem services that are generated through the exploitation of nature, such as fishing and the use of nature for ecotourism or recreational activities. The second sphere contains ecosystem services that support the sustenance of the local community and society in general, such as supporting and regulating services. Ecosystem services in this sphere cannot be generated by

providers, but they can be maintained and managed. Between the ecosystem in the first sphere and the second sphere, there is an antagonistic relationship. On the one hand, the first sphere shows the ecosystem services that are generated by exploiting coastal resources, but on the other hand, the second sphere shows the important ecosystem services that can only be obtained if coastal ecosystems are maintained and cared for. But despite the antagonistic relationship between these two types of ecosystem services, there is a one-way dependency from the ecosystem services generated from exploitation to the ones generated from conservation, since the exploitation of nature is only possible when nature is in good condition. People will not utilize resources that are not in favorable condition because it will not be beneficial. For example, tourism activities are only carried out in areas with coral reefs that are healthy. Tour guides will not take tourists to areas where the coral reefs are damaged, because it will not be favorable for the tourists. On the other hand, fishermen will also not go to waters that cannot support fish life, because they will definitely not get a satisfactory catch. The third sphere refers to ecosystem services that are provided directly by nature, but cannot be produced by provider actors; such as ecosystem services that support education and livelihoods.



**Figure 14. Social-interdependencies of coastal communities in Karimunjawa using the framework proposed by Barnaud et al. (2018)**



After identifying the ecosystem services, the second thing I did was to identify the actors who act as "providers". Providers here refer to the actors who contribute to co-producing, degrading, preserving or managing ecosystem services, and who own or are given access to natural resources (Barnaud et al., 2018). In the case of coastal resource utilization in Karimunjawa, fishers and fish farmers are the actors who contribute to co-producing food. However, at the same time, it should be noted that they can also be contributors to the degradation of ecosystem services, for example, by destroying ecosystems to increase their catch. Aside from the fishers, local communities working in the environmental protection sector (here, I refer to them as conservationists) also act as providers who help manage or maintain ecosystem services. They have or have been given access to natural resources but with the aim of maintaining the ecosystems' functions. The next thing that should be identified is the beneficiaries of these ecosystem services. The beneficiaries are the actors that benefit from these ecosystem services, which in this case, consists of the various groups that make up the Karimunjawa community. And finally, the intermediaries who are being represented by the KNPA, the various levels of government agencies, NGOs, and academic institutions.

Now that the actors have been laid out into the framework, the next thing that I could do was to identify the network of interactions and interdependencies among these actors. However, I will explain briefly the interdependencies that can possibly be formed between actors. Firstly, the interdependency among actors that act as providers. Barnaud et al. (2018) claimed that the production capabilities of the providers depend on the behaviors of multiple stakeholders who are able to shape, degrade, or manage the resources. However, providers are not necessarily mutually interdependent. They can become mutually interdependent when they have to produce certain ecosystem services because they value these services as beneficiaries (Barnaud et al., 2018).

Secondly, interdependency can also occur between providers and beneficiaries. According to Barnaud et al. (2018), beneficiaries are highly dependent on the decisions made by providers related to ecosystem services. But providers are not always dependent on beneficiaries. In the case of Karimunjawa Village, beneficiaries are highly dependent on the ability of fishers to provide food. At the same time, beneficiaries also depend on the ability of providers to protect coastal ecosystems in order to obtain coastal ecosystem services that are beneficial for their well-being.

Thirdly, interdependency can also be formed among the beneficiaries. According to Barnaud et al. (2018), the existence of ecosystem services that are antagonistic to other

ecosystem services can lead to conflicts of interests among beneficiaries. On one hand, beneficiaries benefit from ecosystem services generated from the exploitation of natural resources, but on the other hand beneficiaries also benefit from the ones that are generated from nature conservation. Ecosystem services that synergize with other ecosystem services, however, can create mutual interests among beneficiaries. These mutual interests are likely to encourage actors to work together to form collective actions in order to achieve a more sustainable distribution of ecosystem services.

Fourthly, the interdependencies that formed among intermediaries, providers and beneficiaries are related to the ability of intermediaries to provide mediation within the interdependencies that exist. Intermediaries, through the enforcement of rules and regulations, guide the utilization of natural resources and the distribution of ecosystem services so that both are not done in a haphazard manner. In solving environmental problems, both providers and beneficiaries often rely on intermediaries to provide solutions.

### **6.2.2. Analysis on Social Interdependencies**

To analyze social interdependencies among actors, Barnaud et al. (2018) stated that there are four dimensions that need to be considered: cognitive framing of interdependencies, levels of organization, institutions, and power relations.

#### **a. Cognitive Framing of Interdependencies**

The cognitive framing of interdependencies refers to the ability of local actors to recognize socio-ecological and social dependencies on ecosystem services (Zaga-Mendez et al., 2021). In Karimunjawa, the dependency among providers is shown through how the ability of fishers and fish farmers to co-produce food depends on the ability of conservationists to help maintain the ecosystem that produces the food source. However, fishermen and fish farmers have recently stopped being mere "exploiters" of nature; they have slowly been more involved in efforts to conserve natural resources from degradation. Even though both fishers and conservationists in Karimunjawa have a role to play in preserving resources, in reality, they are not on equal standing. The conservationists in Karimunjawa are directly working under the orders of the intermediaries (especially KNPA). This has given them a chance to be given more knowledge on natural resources and how conservation is supposed to be done. In addition to that, due to the partnership between the KPNA and the community, the community members that have volunteered or have decided to work under the intermediaries are required to provide assistance in implementing nature protection duties. These duties include disciplining fishermen who do not comply with the fishing regulations and other community members who do not comply

with the national park regulations. From this, it is apparent that the conservationists have a little more power than the other community members; and they are entitled to exercise that power as long as it is intended for conservation.

The interdependency between beneficiaries and providers is shown through how tour guides and tourists depend on fishers to provide fish for consumption. As discussed previously, the growing tourism sector in Karimunjawa has led to an increase in the demand for fish, which in turn resulted in overfishing as fishermen compete to supply fish. However, this dependency is not a one-way relationship. Providers are also dependent on beneficiaries, where fishermen are dependent on the market demand for fish. The more fish they can supply, the more profit they can make. On the other hand, tour guides who rely heavily on natural beauty, especially coral reef ecosystems, depend on conservationists to maintain biodiversity while providing them with knowledge on how to implement sustainable tourism.

The dependency of providers and beneficiaries on intermediaries is exemplified by the case in which the community complained about the environmental impacts caused by Vannamei shrimp farms. The increasing number of shrimp farms built in Karimunjawa has caused extensive damage to the coastal ecosystem, mainly due to the waste that is directly discharged into the sea. As a solution to these complaints, on March 2023 (as reported by Setiawan, 2023 – for *Tribun Muria*), the government made a statement that these shrimp farms would be given time to harvest, after which all farms would be closed and no longer allowed to operate in Karimunjawa. Aside from this, there is also a dependency from the intermediaries on both providers and beneficiaries. For example, the ability of KNPA to successfully manage the natural resources depends on the ability of both providers and beneficiaries to be able to follow the national park's regulations to not recklessly exploit coastal resources, and for them to participate in the promotion of nature conservation and more sustainable use of natural resources.

#### **b. Levels of Organization and Institutions**

Zaga-Mendez et al. (2021) stated that ecosystem services are generated at various ecological and spatial levels. Not only that, the beneficiaries who receive ecosystem services are also formed at various institutional levels. Barnaud et al. (2018) note that through the ecosystem services lens, which typically consists of local users and managers, we can determine whether the collective action arena can or should be expanded to include non-local external parties operating at higher levels of governance. Doing so, however, would create greater social distance between stakeholders in this expanded action area, hindering collective action.

Since Karimunjawa Village (along with the other villages in Karimunjawa Islands) is within the Karimunjawa National Park (KNP), the natural resources management within the area is carried out by the Karimunjawa National Park Authority (KNPA). In Indonesia, holding the status of a national park will automatically expand the action arena so that the park's management involves not only the local government but also the central government. This has actually been regulated in the Indonesian Law No.5 of 1990 on Conservation of Natural Resources, which reads:

*“The management of national parks, botanical forest parks, and nature tourism parks shall be carried out by the government.”* – Article 34, paragraph (1)

Additionally, the status of Karimunjawa National Park Authority is a Class II National Park Technical Implementation Unit, which has been regulated in the Minister of Environment and Forestry Regulation No.P.07/MenLHK/Setjen/OTL.1/2016:

*“The National Park Technical Implementation Unit is a management unit for the implementation of conservation of natural resources and ecosystems under and responsible to the Director General of Natural Resources and Ecosystem Conservation.”* – Article 1, paragraph (1)

The Directorate General of Natural Resources and Ecosystem Conservation is directly responsible to the Ministry of Environment and Forestry. So from this, it is quite apparent that the governance in Karimunjawa is still very much centralized.

In terms of the level of organization among the beneficiaries, informal and formal organizations can be established to regulate the social interdependencies among beneficiaries in the distribution of ecosystem services (Ostrom, 2009). Such institutions usually take the form of market-based arrangements, state-based instruments such as payments for ecosystem services (PES), incentives or subsidies, and local collective action. In this study, I will only discuss the institutions in the form of collective actions since that is the initial focus of my research. According to one key respondent representing the KNPA, after years of socialization, education, and involvement in conservation actions organized by the KNPA and the government, local communities are now considered "partners" by the KNPA. They have begun to be involved in various decision-making processes and are allowed to negotiate. Because of this partnership, several community groups such as SPKP (*Sentra Penyuluhan Kehutanan Pedesaan* in Indonesian – Center for Rural and Forestry Socialization) and MMP (*Masyarakat Mitra Polhut* in Indonesian – Local Communities and Forest Rangers Partnership Program) were formed to allow easier coordination.

According to KNPA, members of SPKP consist of local people from each village within the Karimunjawa Islands who come from various backgrounds and occupations, although most members work as fishermen. SPKP was established approximately 10 years ago to provide a platform for local community members and groups to receive guidance and assistance, especially regarding the sustainable use of coastal and marine resources and establishing alternative livelihoods. SPKP fosters its members to advance micro, small, and medium enterprises (MSMEs – *Usaha Mikro, Kecil dan Menengah (UMKM)* in Indonesian) through various financial and material assistance. The intention is to make them less dependent on the extraction of natural resources. Today, many Karimunjawa residents have shifted their livelihoods - once fishermen, many have now become lodging providers or traders by opening small convenience shops.

Since its establishment until now, SPKP and KNPA have worked together mainly through regular conservation socialization activities. Regular meetings are often held to monitor the condition and development of KNPA-mentored groups and to facilitate SPKP's need to remain enthusiastic in working together to preserve Karimunjawa's nature, especially in dealing with the problems of waste pollution, forest fires, and illegal logging. One of KNPA's expectations from SPKP is for its members to become pioneers among the general public in raising conservation awareness in each village in Karimunjawa Islands. In addition to that, SPKP is also expected to be able to develop programs that can support conservation, such as seedling nurseries, regular beach clean-ups, and others.

In November 2020, KNPA and the Karimunjawa Village government signed a conservation agreement that was attended by the chairman of KNPA, the head of Karimunjawa Village, the head of Karimunjawa sub-district, and the head of the Region II - Karimunjawa National Park Management Section (SPTN II Karimunjawa) (KSDAE, 2020). This agreement served as an effort to empower the community in Karimunjawa National Park to develop community independence and welfare by enhancing knowledge, attitudes, behavior, abilities, and awareness of utilizing natural resources. One crucial point that needs to be underlined from this agreement is that the KNPA provides access for the utilization of areas in the traditional fisheries zone and mariculture zone in accordance with established zoning regulations, intending to improve the welfare of the Karimunjawa village community. This access is legally granted to the Karya Bhakti SPKP group (SPKP in Karimunjawa; each group has its own name), but all Karimunjawa villagers may also access these zones.

The Community and Forest Police Partnership Program (MMP) was established as a participatory national park security effort that involves local residents of Karimunjawa Islands who volunteered to participate in ensuring the security of the conservation areas (BTNK, 2011). The MMP is coordinated based on the village administrative boundary. The

Karimunjawa Village MMP works directly with KNPA, the government agencies (Karimunjawa Village, Karimunjawa Sub-district, and Jepara District), and the police forces in both Karimunjawa Sub-district and Jepara District. The monitoring program conducted by the MMP includes pre-emptive, preventive, and repressive programs. According to one key respondent who represented the MMP, preemptive supervision includes dialogue activities, providing examples of good behavior to residents, providing explanations on filing complaints or reports, conducting socialization, and conducting continuous observation of the proper procedures in dealing with criminal cases. Preventive supervision includes independent patrols and joint patrols with the forest police, protecting the area from the trafficking of forest and marine products, as well as supervision of natural resource extraction activities and tourism activities. While repressive supervision includes collecting materials and information regarding certain crimes, implementing joint operations with the forest police or other related agencies, and problem-solving in independent patrol activities.

The KNPA itself has also built partnerships with other stakeholders to increase the effectiveness of its work as an intermediary and optimally manage Karimunjawa National Park. One partnership that has been established for quite a while now is with the Wildlife Conservation Society (WCS). This partnership has existed for more than 10 years, aiming to improve the effectiveness of the national park's management and enhance natural resource protection and community welfare. According to one key respondent on behalf of WCS, the success of this partnership is directly related to the fact that both parties share the same vision, mission, and goals. One form of WCS's commitment to helping improve the effectiveness of national park management is through the provision of scientific data and information. The provision of scientific data and information on coral reefs in Karimunjawa has been conducted through a series of monitoring programs since 2004. In addition, WCS has also taken several initiatives and participated in various programs that were implemented to build community support and management plans and raise awareness of the status and benefits of the new management strategy. In general, WCS in Karimunjawa has been conducting assessments of the ecological condition of coral reef habitats and evaluating the socio-economic factors that constrain fisheries management and conservation within the park. The KNPA even used the coral reef baseline data that WCS provided to redesign the marine park's zoning plan as part of marine resource management between 2003 and 2006. As the relationship between WCS and KNP has been well established over the years, there has been many Karimunjawa residents who work for WCS and are stationed in Karimunjawa. According to residents who work for WCS, this is also an effort to empower local communities in natural resource management.

### c. Power Relations Among Local Actors

According to Robbins (2004; in Zaga-Mendez et al., 2021), identifying power relations is one of the critical concepts of political ecology, so that the driving forces of environmental governance can be identified. Within the social interdependencies network, Zaga-Mendez et al. (2021) emphasized the identification of stakeholders who are able to impose their views on ecosystem services governance and influence how other actors act. By doing this, we can then see how natural resource management can be influenced by the power imbalances that exist within the interdependency network.

Among both providers and beneficiaries of the ecosystem services in Karimunjawa Village, a power play occurs. This is also the case with how the intermediaries interact with providers and beneficiaries, even as to sharing the power that the intermediaries hold with them. This relates to the "levels of organization" I have discussed previously. Under Indonesian law, Karimunjawa's status as a national park means that the action arena for natural resource management extends to the central government. So the management of Karimunjawa National Park (KNP) does not stop at the Karimunjawa National Park Authority (KNPA) but extends up to the ministry level. However, due to the decentralization in natural resources governance in Indonesian that has been going on for quite a while now, the central government invited other stakeholders (such as NGOs and academic institutions) and local communities into the management domain so that they can work together to promote sustainable coastal resources management. Within this process, the central government transfers some of its power to these stakeholders.

Through its partnership with the Wildlife Conservation Society (WCS), KNPA has invited WCS to participate in the making of decisions in the management of the national park. In this relationship, however, I would not say that the Indonesian government or KNPA "gave" WCS some of their power, but rather it seems to be that they are on equal standing. On the other hand, KNPA transfers some of its power to the MMP (The Community and Forest Police Partnership Program) members so that they can help patrol the park and discipline anyone that does not comply with the national park regulations. This makes it seem that the MMP acts as an extension of the power holder, which is KNPA.

Regarding the power relations among providers, in Karimunjawa, fishers have long been encouraged to participate in sustainable fishing. Their fishing activities in the sea are being monitored by KNPA and MMP, which means that the MMP members have the right to regulate how fishers behave in the sea. Power-sharing by the intermediaries to the beneficiaries is shown through the formation of community groups such as SPKP (*Sentra Penyuluhan Kehutanan Pedesaan* in Indonesian – Center for Rural and Forestry Socialization) whose members are not only fishermen and conservationists (who act as

ecosystem service providers), but also other local communities who have other occupations, such as tour guides and merchants/traders. This local institution was formed with the aim of making the distribution of ecosystem services easier to manage and more sustainable. As described previously, the mission of the SPKP in each village within the Karimunjawa National Park (KNP) is to raise awareness on conservation and sustainable resource use among local residents. This means that the SPKP acts as an extension of the intermediaries, who became a representative for the intermediaries so that management can appear "on the same level" as the local community. Through my discussion in this sub-section, it is quite apparent that the power held by KNPA and its extensions has a very strong influence on shaping the network of interactions and interdependencies among local actors.

### **6.2.3. Summary**

This sub-section presents how local stakeholders depend on each other through the use of social interdependency framework that was suggested by Barnaud et al. (2018). According to the analysis of the framework by examining how the four main components apply in Karimunjawa Village, it can be said that the community members recognize the interdependencies within the community. However, they are coordinated into local institutions based on the decisions made by the KNPA, which is a delegation of the central government to manage Karimunjawa National Park. This means that the KNPA and all the rules made by the central government have a significant role in shaping the interdependency network within the Karimunjawa local community. This is related to the statement of Barnaud et al. (2018), where social interdependencies between communities can be influenced by rules or regulations that are implemented within an action arena. This predominantly centralized power influences how local communities perform collective actions. The following section explains the collective actions that have been carried out in Karimunjawa Village in more detail.

## **6.3. Collective Actions in Karimunjawa Village**

With how resource governance being more decentralized in recent years, local communities are being more involved in the governance process. There are even community-based management practices where communities, rather than the conventional central government, become the primary actor within the management domain. In terms of collective action, it can be a result of well-fostered mutual trust and increased level of interaction among local community members when they are able to recognize and be aware of their own interdependencies. However, Barnaud et al. (2018)



have stated that people's awareness of social interdependencies among themselves is influenced by the existence (or absence) of regulations or sets of rules that are implemented within an action arena. According to my previous discussions on this, it appears that social interdependencies in Karimunjawa Village are greatly influenced by the KNPA and the regulations that are being implemented. From here on, I will discuss how such interdependencies can shape the collective actions that had been conducted in Karimunjawa Village.

### **6.3.1. Collective Actions in Karimunjawa**

During the interviews, I asked the respondents if there were any collective actions that had taken place in Karimunjawa Village that were aimed to promote conservation and a more sustainable use of natural resources. They responded by saying “no” unequivocally. I initially assumed that perhaps they didn’t understand what a “collective action” means. After being given a short explanation of what collective actions are, almost all of them still said “no”. I have to note that the initial question that I posed to them was about “community-initiated collective actions”, because I wanted to know whether or not local communities in Karimunjawa Village had ever formed collective actions based on their own initiative. When providing their answer, the leader of one of the fishermen unions stated:

*“Some of us (the general public) do not have the awareness strong enough to initiate and coordinate among ourselves to form collective actions. We still need another party to take the initiative and invite us to participate.”*

Rather than building connections and increasing their interactions with other unions or groups, the fishermen unions have been focusing more on the internal communication and activities within their own respective unions. From this, it is quite apparent that the local community is still highly reliant on mediators to come up with conservation programs or activities in which they can be invited in as participants. This was confirmed by the key respondents on behalf of KNPA, with them stating:

*“A collaboration among the residents? No, there hasn’t been one. Obviously, they can’t do it on their own. The one who coordinates is usually still us (KNPA).”*

Because it turned out that the so-called “community-initiated collective actions” had never been carried out in Karimunjawa Village, I then changed the focus of this study to “collective actions”, to investigate all the collective actions that had been carried out that involved local community members, including the ones that were initiated by non-local actors.

There was one example of a collective action that was claimed to be “stemmed from the local community’s concerns”. In 2016, one respondent working for WCS stated there was a case where some community members, specifically the tour guides, felt that the impact of mass-tourism in Karimunjawa had become too great. This impact could be seen from how heavily damaged the coral reefs around Menjangan Kecil Island were. Menjangan Kecil Island is one of the islands in Karimunjawa Islands that had become one of the most popular destinations for tourists to visit. The respondent stated that:

*“The local residents were concerned because so many of the coral reefs near the island were damaged. Plus, the damage towards other ecosystems caused by litters and pollution have affected the quality of the surrounding waters. The fishermen also complained the fish stock around the area were getting lower and lower.”*

Because of this, the tour guides presented their concerns to KNPA, in hopes that measures could be taken to prevent further degradation. The KNPA then had a discussion that involved WCS, the government, as well as the local community so that they can come up with an appropriate course of action. The agreed-upon decision was to temporarily close a portion of Menjangan Kecil Island, especially the spot that was very popular among tourists called the "Maer Spot". The Maer Spot is famous for its beautiful coral reef ecosystem. Apparently, the depth of the water in Maer Spot is very shallow, only 0.4 - 5 meters, making the coral reefs in this area very susceptible to damages caused by snorkeling or diving activities. The decision to close Maer Spot was made to stop all kinds of activities, in an effort to give time for the coral reef ecosystem in this area to "heal".

After careful consideration, the closure of Maer Spot was implemented in 2018, and lasted for three years. Every year, KNPA and WCS conducted monitoring and evaluation to see if there were any improvements in the coral reef ecosystem. Apparently, after three years of closure, the condition of the coral reefs in Maer Spot had significantly improved. The fish stock has also increased, albeit insignificantly. Even after three years of closure, the opening of Maer Spot was postponed due to the pandemic. Maer Spot was then reopened in October 2022. The re-opening of Maer Spot to the public came with a new condition; visits to Maer Spot were restricted to professional divers. The key respondent on behalf of WCS stated that the closure of Maer Spot had generated a "success story" that is expected to be a kind of "eye-opener" for the community, both local and non-local, on how important it is to protect the coral reef ecosystem and nature in general. However, the respondent made one point clear: just because the "open-close" method of nature protection was successful in Menjangan Kecil, it doesn't necessarily mean that it would be

successful elsewhere. It is not the only mean of rehabilitating biodiversity, particularly for coral reefs.

The closure of Maer Spot was claimed to stem from the community's concern about the condition of the coral reef ecosystem that had been severely affected by mass tourism activities. One of the consequences of this was the decline in fish stock around the area. It can be said that at that time, the provisioning and supporting functions of the coral reef ecosystem were not working as it should. This then prompted the governing bodies to issue a regulation to close Maer Spot in an attempt to restore the condition of the ecosystem. Although the respondents claimed that the community had a contribution that led to this regulation, the community's role was relatively minor. So what exactly is the degree of participation of the local community in this "collective action"? Can this case be referred to as a "collective action" at all? The closure of Maer Spot will not generate such significant results if there were no compliancy from the local community. The local community understood that for them to receive the optimal benefits from the ecosystems surrounding the Maer Spot, they would have to abide by the rules that were being implemented. According to the definition of Scott and Marshall (2009, in Mills et al., 2011), collective actions are actions that are taken by a group of people in pursuit of the people's perceived shared interests. In this sense, compliancy exercised by a group of people is enough to be called a collective action.

The only case of collective action that was mentioned was with the case of Maer Spot closure. In actuality, there are several other activities organized by the KNPA that involve community participation. However, these activities tend to involve all communities that reside within the area of the national park, not just limited to Karimunjawa Village. Activities carried out within the village administrative level tend to be in the form of counseling, workshops, socialization, as well as education in schools. Other activities, such as mangrove planting, turtle release, and even coral reef transplanted are carried out periodically in other villages, one of which is Kemujan Village. Perhaps this study could have told a more diverse story of collective actions if the scope of the research was expanded and not limited to Karimunjawa Village.

### **6.3.2. Why is the Collective Action in Karimunjawa the Way It Is?**

As I have previously discussed, how the local community of Karimunjawa conduct or participate in collective actions was to comply to the rules and regulations that are being implemented in the national park. I mentioned that the main focus of my study has shifted, from "community-initiated collective action" to simply "collective action". What I attempted to do was to explore the ability of local communities to both form and execute collective actions based on their perceptions of ecosystem services. However, the mistake

that I made was I did not try to take into account the relationship between local communities and actors outside of that “locality”, such as the government and other non-local actors. Only later on I found out that “local community” can hardly be separated from its relationship with actors outside of the local scale, as Ojha et al. (2016) had stated. Additionally, a number of the respondents that I interviewed stated that they have limitations in the financial, material, and knowledge aspects, which lead them to depend highly on intermediaries and other actors to give them the guidance and resources that they need to implement conservation actions.

I would like to address again about the clear rules on how the management in Karimunjawa (and other national parks in Indonesia in general) is conducted. This has been discussed in the previous sub-section, in which I presented an article of the Indonesian Law No.5 of 1990 on Conservation of Natural Resources that reads:

*“The management of national parks, botanical forest parks, and nature tourism parks shall be carried out by the government.”* – (Article 34, paragraph (1))

And if we look in more detail at the law, there is another section that reads:

*“Community participation in the conservation of natural resources and their ecosystems is directed and driven by the government through various activities that are efficient and effective.”* - (Article 37, paragraph (1))

Which was then followed by:

*“In developing the community as referred to in paragraph (1), the government shall foster and increase the awareness of conservation of natural resources and their ecosystems among the community through education and counseling.”* - (Article 37, paragraph (2))

From the paragraphs in this law, it is clear that control over national parks is still fully held by the central government. In simple terms, the management still uses a top-down approach, where local community members are not authorized to carry out conservation actions without the supervision of the national park agency and the government. In regards to the Maer Spot closure, it has actually been regulated as well in Article 35 of the same law:

*“In certain circumstances and when it is absolutely necessary to maintain or restore the sustainability of natural resources and their ecosystems, the government may cease utilization activities and shut down national parks,*

*botanical forest parks, and nature tourism parks partially or completely for a certain period of time." - (Article 35)*

So it is apparent that the management and decision-making of all activities up to the establishment of regulations in Karimunjawa are all controlled by the central government through the Karimunjawa National Park Authority (KNPA). Local communities in Karimunjawa are not being given the freedom to research, organize, or carry out their own collective actions because of the strict laws that govern the national park. However, this does not mean that the local community will be completely absent from collective actions. The closure of Maer Spot, which was able to produce positive results, demonstrated that there was a compliancy from the community in Karimunjawa to adhere to the regulations that forbid them to conduct any activities in Maer Spot. Their compliance with this regulation can actually be considered as a form of a collective action, as I have previously discussed.

I would also like compare the collective action in Karimunjawa Village to another collective action that was carried out in Tongke-tongke Village, which is located in South Sulawesi. I am including this comparison to show that collective action can take different forms among different communities. The following case was published by Suharti et al. (2022) in their article titled "*Conditions for Successful Local Collective Action in Mangrove Forest Management: Some Evidences from Eastern Coastal Area of South Sulawesi, Indonesia*". The collective action that took place in Tongke-tongke Village was a collective action that was initiated by the local community itself, and has become somewhat of a success story in coastal area management in Indonesia. The collective action in Tongke-tongke Village stems from the local community's awareness of the importance of mangroves in coastal areas, especially in providing regulating services such as water filtration and coastal area protection.

Since the 1930s, the local community in Tongke-tongke Village has been planting mangroves individually – meaning that they were planted by individuals on their own terms. The problem was that at that time, there were no agreed-upon rules or regulations among the community members on how to properly plant mangroves. In the 1940s, due to economic pressures, the mangroves that naturally existed and the mangroves that the residents had planted were cut down to be converted into fish farms. This had an unfortunate impact, especially in terms of coastal area protection, which lead the coastal area in Tongke-tongke Village to be severely damaged caused by abrasion. For around 40 years, until the 1980s, this problem received no attention from the government. The community ended up building embankments to mitigate the damage caused by seawater abrasion, but unfortunately, these embankments were unable to withstand the strong waves. However, during this time, the community realized how the remaining mangroves

that were still standing were able to withstand the waves, and able to provide protection for the coastal area despite their small number. Eventually, the community, through the initiative of the community's leaders, worked together to plant more mangroves. Through the initiator, a farmer group was formed which attracted the attention of the government who then supported the community activities by providing institutional development and counseling programs. The farmer group that was formed by the community was then legalized as a formal institution by the government.

What is the difference between the collective actions that took place in Karimunjawa and Tongke-tongke? It is immediately apparent that the local community of Tongke-tongke Village played a major role in the collective action. In comparison, the role of the community in Karimunjawa appeared to be minor. It should be noted that Tongke-tongke Village is not part of a national park, so laws and regulations like the ones implemented in Karimunjawa did not apply in Tongke-tongke. The people of Tongke-tongke had to experience first-hand the impact of the loss of the mangroves' ability to protect them from wave damage, which for many years, had no solution. They eventually resorted to building embankments, which didn't help them in the long run. But from this point on, when they agreed to finally work together to collectively plant mangroves together so they can acquire better coastal protection, there was a collective learning that took place. They learned from their experience of implementing incorrect management practice, to being able to find a solution that would work only if they cooperate and coordinate themselves to take action. The Karimunjawa community did not seem to experience collective learning the same way the Tongke-tongke community did. In Karimunjawa, the rules and regulations have been laid out in front of them, so for any issues or environmental problems that occur within the national park, the solutions will be arranged and provided by the national park agency, the government, and other organizations. The local community may be involved, but they do not have control in the problem-solving and decision-making processes. The community in Tongke-tongke, on the contrary, they had to identify for themselves what steps were appropriate to solve the environmental problems that they were experiencing.

Additionally, because the Karimunjawa community received assistance from intermediaries in solving environmental problems, the dependency patterns and interaction networks that formed among the community members in Karimunjawa had developed differently from the patterns and networks that had formed in Tongke-tongke. In the case of Maer Spot, to whom did the community address their concerns firstly? To the intermediaries. This means that from the beginning, the Karimunjawa community depended on and interacted directly with intermediaries – likely because they were required to do so, according to the law. On the other hand, the Tongke-tongke community

at that time received no attention and support from the intermediaries or other parties outside of their community, so the first interaction they had was among themselves. The collective action to plant mangroves together was also carried out because the Tongke-tongke community recognized the interdependencies that exist among them. They realized that to get the optimal protection of coastal areas, mangrove planting could be faster and more effective if done together. This shows that the interdependency network that was formed in Tongke-tongke mainly consisted of a series of dependencies within the local community – among community members. From these two cases, it can be easily understood that the presence of intermediaries and external parties is very influential in the development of interaction patterns and dependencies that developed among local communities.

Since the patterns of interaction and interdependency in Karimunjawa and Tongke-tongke had developed differently, the "sense of community" that the community members of these villages had had also developed differently. Tongke-tongke community members had strong connections with each other because prior to and by the time the collective action was implemented, communication and interactions between community members had already been carried out intensely. According to Suharti et al. (2022) within the community there was already respect and mutual trust that was formed due to their belief in reciprocal relationships. These elements then became a strong social capital that was able to produce a successful community-based collective action. On the other hand, in Karimunjawa, some respondents stated that the interactions between community members in relation to conservation actions has been very limited.

*"We (community members) rarely interact to discuss conservation programs. The only time we get to meet is only when we are invited to a program, such as counseling or socialization. That's when we interact. But it's not to discuss programs or anything. Just as fellow participants." - (Fisherman)*

The fisherman did not specifically mention who organized the program, as there had been many programs in which the community members were invited to participate. Additionally, several of these programs were organized by a variety of local and non-local organizations and agencies. However, it is clear that the presence of actors who are not part of the local community can influence how community members interact with each other, just as Ojha et al. (2016) has stated in their study. A result like this has also been presented in the Purwanti's (2008) study in which she revealed that the regulatory substances inside the national park were focused on the centralization of authority by the central government, which produced a sense of "not owning" among the community members. This just shows

there hasn't been an improvement in the raising of awareness and empowerment of community's participation in natural resources management.

### **6.3.3. Summary**

This sub-chapter discusses how the network of interdependence that exists within the community of Karimunjawa can lead to collective actions. According to respondents, collective action in Karimunjawa Village is exemplified through the case of the Maer Spot closure, where the community cooperated with other stakeholders to implement the closure of this popular tourist site to prevent activities from taking place in order to improve the condition of the coral reef ecosystem. Although the community participated in the decision-making process of this regulation, when compared to the collective action that was carried out elsewhere, their role was somewhat not very prominent. This is due to the fact that Karimunjawa Village is located within a national park area, therefore the rules and regulations applied by the central government have a major influence on all decisions and activities that can be carried out. The strong influence of the central government shapes the network of interactions and interdependencies between community members distinctively, where when a decision needs to be made, the community will first interact with the intermediaries, rather than internally within the community. This has led to a less developed sense of community among community members. In terms of conservation actions and the promotion of a more sustainable utilization of coastal resources, community interaction and dependence tend to be strong towards the KNPA and the government, thus the collective action that was implemented positioned them merely as consultants and rule-followers.



## CHAPTER 7:

# CONCLUSIONS

---

This study was conducted to find out how value placement by local communities to coastal ecosystem services (especially those provided by mangroves, seagrass, and coral reefs) can generate collective actions. To understand this, I conducted my study in Karimunjawa Village, which is located within the Karimunjawa National Park (KNP) in Indonesia. I incorporated the social interdependency framework proposed by Cécile Barnaud et al. (2018) in their publication titled "Ecosystem services, social interdependencies, and collective action: a conceptual framework" to identify the interdependencies that occur among community members based on how they value ecosystem services that they receive. Through the use of this framework, I have found out how local communities, both individuals and groups, depend on each other for a more sustainable yet fair acquisition and use of ecosystem services. These interdependencies, according to Barnaud et al. (2018) can lead to collective actions among local communities.

To answer the first research question of this study, it was found that the way that the local community in Karimunjawa Village place value on ecosystem services is influenced by their knowledge of ecosystem services, and whether or not they directly benefit from them. Fishermen, for example, during the interview, revealed that they place more value on ecosystem services that they know about and directly benefit from. Other community members who have more knowledge on ecosystems and conservation, on the other hand, tend to mention the ecosystem services that they do not even directly benefit from. Using the types of ecosystem services valued by these community members, I have identified the actors behind the production and distribution of these ecosystem services - who act as providers, who act as beneficiaries, and who act as intermediaries that can mediate the production and utilization of ecosystem services. Through the social interdependencies framework proposed by Barnaud et al. (2018) the interactions and interdependencies between these actors can be analyzed and understood.

In relation to the second research question in this study, through the analysis of the social interdependency framework that I applied to the case of Karimunjawa Village, the network of interactions within the community can be clearly seen - who depends on whom. These interdependencies are an important part in determining the success of collective action through the development of community groups and local institutions. However, due to the implementation of national park regulations in Karimunjawa, the community members are being coordinated into local groups or institutions based on decisions that

were made by the Karimunjawa National Park Authority (KNPA), in an effort to facilitate coordination in the partnership formed between the KNPA and the local community. From this framework, it can also be seen that the biggest factor that shapes how these interdependencies are formed is the influence of KNPA and the central government, which is still strong in the management domain of Karimunjawa National Park. All activities related to the conservation of coastal ecosystems (in particular mangroves, seagrass, and coral reefs) are directly supervised by the KNPA. This, in fact, has been regulated in the Indonesian law. This dominant influence of intermediaries has affected how local community members interact with each other.

In regards of the third research question of this study, it was discovered that coordination within the local community in Karimunjawa Village for collective actions, especially between actors in different sectors, was found to be lacking. Local groups tend not to interact with each other unless they are placed in the same space where they are expected to participate in a program. This situation is mainly due to their high dependency on intermediaries to solve environmental problems that occur in Karimunjawa. This dynamic of interactions within the community shows that among the community members in Karimunjawa, resulted in a "sense of community" that had developed differently to the one that had developed in a community where interactions are intense among community members, such as in the case of Tongke-tongke Village that is located in South Sulawesi (based on the study of Suharti et al., 2022). This is because when collective action in Tongke-tongke occurred, the role of intermediaries and external actors were minimal, and discussions and resolution of environmental problems were carried out within the scope of the local community.

This study is not intended to assess or evaluate the effectiveness of the collective action that had been carried out in Karimunjawa Village. Nor it is intended to pinpoint whether or not the collective action in Karimunjawa Village is successful. Rather, this study aims to show that collective actions can take many different forms, depending on how the interactions within the community within an area are developed. This study highlights the interdependencies between actors within a coastal community, and as previously discussed, the interdependency network that can be developed within an area is influenced by the existing rules that are being implemented. These existing rules can either be an inhibitor to collective actions, or they can actually facilitate these actions – as long as they are in accordance with the rules that are in place.

As local communities become increasingly involved in natural resource management, the findings of this study are expected to shed light on the importance of fostering good intracommunity relations in order to achieve effective collective actions. Which can help later on when a co-management or community-based management is to be implemented.

However, there's a limitation to this study that lies in the lack of attention given to the historical record of past collective actions undertaken in Karimunjawa Village. If this had been considered, an objective and detailed assessment of collective actions could have been made, including a comparison between the actions that was carried out before and after the establishment of Karimunjawa National Park.



## REFERENCES

---

- Abson, D. J., von Wehrden, H., Baumgärtner, S., Fischer, J., Hanspach, J., Härdtle, W., Heinrichs, H., Klein, A. M., Lang, D. J., Martens, P., & Walmsley, D. (2014). Ecosystem services as a boundary object for sustainability. *Ecological Economics*, 103, 29-37. <https://doi.org/10.1016/j.ecolecon.2014.04.012>
- Agrawal, A., & Gibson, C. C. (1999). Enchantment and disenchantment: The role of community in natural resource conservation. *World Development*, 27(4), 6299-6649. [https://doi.org/10.1016/s0305-750x\(98\)00161-2](https://doi.org/10.1016/s0305-750x(98)00161-2)
- Ayyam, V., Palanivel, S., & Chandrakasan, S. (2019). *Coastal Ecosystems of the Tropics - Adaptive Management*. Springer Nature Singapore Pte Ltd. <https://doi.org/10.1007/978-981-13-8926-9>
- Barbier, E. B. (2017). Marine ecosystem services. *Current Biology*, 27(11), R507-R510. <https://doi.org/10.1016/j.cub.2017.03.020>
- Barbier, E. B., Hacker, S. D., Kennedy, C. J., Koch, E., Stier, A. C., & Silliman, B. R. (2011). The Value of estuarine and coastal ecosystem services. *Ecological Monographs*, 81(2), 169-193. <https://doi.org/10.1890/10-1510.1>
- Barnaud, C., & Antona, M. (2014). Deconstructing ecosystem services: Uncertainties and controversies around a socially constructed concept. *Geoforum*(56), 113-123. <https://doi.org/10.1016/j.geoforum.2014.07.003>
- Barnaud, C., Corbera, E., Muradian, R., Salliou, N., Sirami, C., Vialatte, A., Choisis, J., Dendocker, N., Mathevet, R., Moreau, C., Reyes-Garcia, V., Boada, M., Deconchat, M., Cibien, C., Garnier, S., Maneja, R., & Antona, M. (2018). Ecosystem services, social interdependencies, and collective action: a conceptual framework. *Ecology and Society*, 23(1), 15. <https://doi.org/10.5751/ES-09848-230115>
- Bastian, O., Haase, D., & Grunewald, K. (2012). Ecosystem properties, potentials and services - The EPPS conceptual framework and an urban application example. *Ecological Indicators*, 21, 7-16. <https://doi.org/10.1016/j.ecolind.2011.03.014>
- Basyuni, M., Sasmito, S. D., Analuddin, K., Ulqodry, T. Z., Saragi-Sasmito, M. F., Eddy, S., & Milantara, N. (2022). Mangrove Biodiversity, Conservation and Roles for Livelihoods in Indonesia. In S. C. Das, Pullaiah, & E. C. Ashton (Eds.), *Mangroves: Biodiversity, Livelihoods and Conservation* (pp. 397-445). Springer. [https://doi.org/10.1007/978-981-19-0519-3\\_16](https://doi.org/10.1007/978-981-19-0519-3_16)
- Baweja, P., Kumar, S., Sahoo, D., & Levine, I. (2016). Biology of Seaweeds. In J. Fleurence & I. Levine (Eds.), *Seaweed in Health and Disease Prevention* (pp. 41-106). Elsevier. <https://doi.org/10.1016/B978-0-12-802772-1.00003-8>
- Bayraktarov, E., Saunders, M. I., Abdullah, S., Mills, M., Beher, J., Possingham, H. P., Mumby, P. J., & Lovelock, C. E. (2016). The cost and feasibility of marine coastal restoration. *Ecological Applications*, 26(4), 1055-1074. <https://doi.org/10.1890/15-1077>
- Behesht, K. (2018). *Seagrasses, Nature's Water Filter*. The Ocean Foundation. Retrieved 24 February 2023 from <https://oceanfdn.org/seagrasses-natures-water-filter/>
- Berkes, F. (2004). Rethinking community-based conservation. *Conservation Biology*, 18(3), 621-630. <https://doi.org/10.1111/j.1523-1739.2004.00077.x>
- Berkes, F., & Folke, C. (2000). *Linking Social and Ecological Systems: Management practices and social mechanisms for building resilience*. Cambridge University Press.

- Berthet, E. T., Bretagnolle, V., & Gaba, S. (2022). Place-based social-ecological research is crucial for designing collective management of ecosystem services. *Ecosystem Services*, 55, 101426. <https://doi.org/10.1016/j.ecoser.2022.101426>
- Beyerl, K., Putz, O., & Breckwolfdt, A. (2016). The Role of Perceptions for Community-Based Marine Resource Management. *Frontiers in Marine Science*, 3, 238. <https://doi.org/10.3389/fmars.2016.00238>
- Blasiak, R., Spijkers, J., Tokunaga, K., Pittman, J., Yagi, N., & Österblom, H. (2017). Climate change and marine fisheries: Least developed countries top global index of vulnerability. *PLoS ONE*, 12(6), e0179632. <https://doi.org/10.1371/journal.pone.0179632>
- BTNK (Balai Taman Nasional Karimunjawa). (2012a). *Ringkasan Eksklusif Zonasi Taman Nasional Karimunjawa Tahun 2012*.
- BTNK (Balai Taman Nasional Karimunjawa). (2012b). *Zonasi Taman Nasional Karimunjawa Tahun 2012*.
- Burke, L., Kura, Y., Kassem, K., Revenga, C., Spalding, M., & McAllister, D. (2001). *Pilot Analysis of Global Ecosystems: Coastal Ecosystems*.
- Burkhard, B., Kroll, F., Nedkov, S., & Müller, F. (2012). Mapping ecosystem services supply, demand, and budgets. *Ecological Indicators*, 21, 17-29. <https://doi.org/10.1016/j.ecolind.2011.06.019>
- Campbell, S. J., Kartawijaya, T., Yulianto, I., Prasetya, R., & Clifton, J. (2013). Co-management approaches and incentives improve management effectiveness in the Karimunjawa National Park, Indonesia. *Marine Policy*, 41, 72-79. <https://doi.org/10.1016/j.marpol.2012.12.022>
- Carlsson, L., & Berkes, F. (2005). Co-management: concepts and methodological implications. *Journal of Environmental Management*, 75, 65-76.
- Castro, A. J., García-Llorente, M., Martín-López, B., Palomo, I., & Iniesta-Arandía, I. (2013). Multidimensional approaches in ecosystem services assessment. In C. Di Bella & D. Alcaraz-Segura (Eds.), *Earth observation of ecosystem services* (pp. 441-468). Taylor and Francis Group.
- Castro, A. P., & Nielsen, E. (2001). Indigenous people and co-management: implications for conflict management. *Environmental Science & Policy*, 4, 229-239.
- CIFOR (Center for International Forestry Research). (2015). *Mangroves: A global treasure under threat*. Retrieved 29 December 2022 from <https://forestsnews.cifor.org/31178/indonesian-mangroves-special-fact-file-a-global-treasure-under-threat?fnl=en>
- Cinner, J. E., McClanahan, T. R., Graham, N. A. J., Daw, T. M., Maina, J., Stead, S. M., Wamukota, A., Brown, K., & Bodin, Ö. (2012). Vulnerability of coastal communities to key impacts of climate change on coral reef fisheries. *Global Environmental Change*, 22(1), 12-20. <https://doi.org/10.1016/j.gloenvcha.2011.09.018>
- Connell, J. H. (1997). Disturbance and recovery of coral assemblages. *Coral Reefs*, 16, S101-S113. <https://doi.org/10.1007/s003380050246>
- Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R. V., Paruelo, J., Raskin, R. G., Sutton, P., & van den Belt, M. (1997). The value of the world's ecosystem services and natural capital. *Nature*, 387, 253-260. <https://doi.org/doi.org/10.1038/387253a0>
- Crang, M., & Cook, I. (2007). *Doing Ethnographies* (1st ed.). SAGE Publications Ltd.
- Daigle, R. M., Haider, W., Fernández-Lozada, S., Irwin, K., Archambault, P., & Côté, I. M. (2016). From coast to coast: Public perception of ocean-derived benefits in Canada. *Marine Policy*, 74, 77-84. <https://doi.org/10.1016/j.marpol.2016.09.012>

- De Groot, R. S., Wilson, M., & Boumans, R. (2002). A typology for description, classification and valuation of ecosystem functions, goods, and services. *Environmental Economics*, 41, 393-408. [https://doi.org/10.1016/S0921-8009\(02\)00089-7](https://doi.org/10.1016/S0921-8009(02)00089-7)
- Edinger, E. N., Kolasa, J., & Risk, M. J. (2000). Biogeographic Variation in Coral Species Diversity on Coral Reefs in Three Regions of Indonesia. *Diversity and Distributions*, 6(3), 113-127. <https://www.jstor.org/stable/2673326>
- Ellison, A. M., & Farnsworth, E. J. (2001). Mangrove communities. In M. D. Bertness, S. D. Gaines, & M. E. Hay (Eds.), *Marine community ecology* (pp. 423-442). Sinauer Associates.
- Elwell, T. L., Gelcich, S., Gaines, S. D., & López-Carr, D. (2018). Using people's perceptions of ecosystem services to guide modeling and management efforts. *Science of the Total Environment*, 637-638, 1014-1025. <https://doi.org/10.1016/j.scitotenv.2018.04.052>
- Etikan, I., Musa, S. A., & Alkassim, R. S. (2015). Comparison of Convenience Sampling and Purposive Sampling. *American Journal of Theoretical and Applied Statistics*, 5(1), 1-4. <https://doi.org/10.11648/j.ajtas.20160501.11>
- Fabricius, K. E. (2005). Effects of terrestrial runoff on the ecology of corals and coral reefs: review and synthesis. *Marine Pollution Bulletin*, 50, 125-146. <https://doi.org/10.1016/j.marpolbul.2004.11.028>
- Fasham, M. J. (1984). *Flows of Energy and Materials in Marine Ecosystems* (1st ed.). Springer.
- Forman, R. T. T., & Godron, M. (1986). *Landscape Ecology*. John Wiley Sons.
- Frisch, A. J., Cole, A. J., Hobbs, J. A., Rizzari, J. R., & Munkres, K. P. (2012). Effects of spearfishing on reef fish populations in a multi-use conservation area. *PLoS ONE*, 7(12), e51938. <https://doi.org/10.1371/journal.pone.0051938>
- Gkargkavouzi, A., Paraskevopoulos, S., & Matsiori, S. (2020). Public perceptions of the marine environment and behavioral intentions to preserve it: The case of three coastal cities in Greece. *Marine Policy*, 111, 103727. <https://doi.org/10.1016/j.marpol.2019.103727>
- Glaser, M., Breckwoldt, A., Deswandi, R., Radjawali, I., Baitoningsih, W., & Ferse, S. C. A. (2015). Of exploited reefs and fishers e A holistic view on participatory coastal and marine management in an Indonesian archipelago. *Ocean & Coastal Management*, 116, 193-213. <https://doi.org/10.1016/j.ocecoaman.2015.07.022>
- Granek, E. F., Polasky, S., Kappel, C. V., Reed, D. J., Stoms, D. M., Koch, E. W., Kennedy, C. J., Cramer, L. A., Hacker, S. D., Barbier, E. B., Aswani, S., Ruckelshaus, M., Perillo, G. M. E., Silliman, B. R., Muthiga, N., Bael, D., & Wolanski, E. (2010). Ecosystem Services as a Common Language for Coastal Ecosystem-Based Management. *Conservation Biology*, 24(1), 207-216. <https://doi.org/10.1111/j.1523-1739.2009.01355.x>
- Grêt-Regamey, A., Sirén, E., Brunner, S. H., & Weibel, B. (2017). Review of decision support tools to operationalize the ecosystem services concept. *Ecosystem Services*, 26(Part B), 306-315. <https://doi.org/10.1016/j.ecoser.2016.10.012>
- Grober-Dunsmore, R., Pittman, S. J., S., K. M., & Frazer, T. K. (2009). A landscape Ecology Approach for the Study of Ecological Connectivity Across Tropical Marine Seascapes. In I. Nagelkerken (Ed.), *Ecological Connectivity among Tropical Coastal Ecosystems*. Springer, Dordrecht.
- Guannel, G., Arkema, K., Ruggiero, P., & Verutes, G. (2016). The Power of Three: Coral Reefs, Seagrasses and Mangroves Protect Coastal Regions and Increase Their Resilience. *PLoS ONE*, 11(7), e0158094. <https://doi.org/10.1371/journal.pone.0158094>
- Hafsaridewi, R., Sulistiono, Fahrudin, A., Sutrisno, D., & Koeshendrajana, S. (2018). Resource management in the Karimunjawa Islands, Central Java of Indonesia, through DPSIR approach. *AAAC Bioflux*, 10(1), 7-22.
- Hardin, R. (1982). *Collective Action* (Third ed.). The Johns Hopkins University Press.

- Hemminga, M., & Duarte, C. M. (2000). *Seagrass Ecology*. Cambridge University Press.
- Hutomo, M., & Moosa, M. K. (2005). Indonesian marine and coastal biodiversity: Present status. *Indian Journal of Marine Sciences*, 34(1), 88-97.
- Indonesian Ministry of Environment and Forestry (Kementerian Lingkungan Hidup dan Kehutanan Republik Indonesia). (2016). *Peraturan Menteri Lingkungan Hidup dan Kehutanan Republik Indonesia No.P7/Menlhk/Setjen/OTL.0/1/2016 tentang Organisasi dan Tata Kerja Unit Pelaksana Teknis Taman Nasional*. Retrieved from [http://ksdae.menlhk.go.id/assets/news/peraturan/P.7 ORGANISASI DAN TATA K ERJA UPT TN .pdf](http://ksdae.menlhk.go.id/assets/news/peraturan/P.7_ORGANISASI_DAN_TATA_KERJA_UPT_TN_.pdf)
- Indonesian Ministry of Forestry (Kementrian Kehutanan Republik Indonesia). (1999). *Penetapan Kawasan Taman Nasional Karimunjawa Sebagai Kawasan Pelestarian Alam*. Jakarta
- Indonesian Ministry of Marine Affairs and Fisheries (Kementerian Kelautan dan Perikanan). (2021). *Napoleon*. Retrieved 28 February 2023 from <https://kkp.go.id/djprl/bpsplpadang/page/317-napoleon>
- Inoue, T. (2015). *Tropical Coastal Ecosystems Portal (TroCEP)*. NIES (National Institute for Environmental Studies). Retrieved 1 February 2023 from <https://www.nies.go.jp/whatsnew/2015/20150821/20150821-e.html>
- Janssen, M. A., & Ostrom, E. (2006). Governing social-ecological systems. In *Handbook of computational economics* (Vol. 2, pp. 1465-1509).
- Jefferson, R., McKinley, E., Capstick, S., Fletcher, S., Griffin, H., & Milanese, M. (2015). Understanding audiences: Making public perceptions research matter to marine conservation. *Ocean & Coastal Management*, 115, 61-70. <https://doi.org/10.1016/j.ocecoaman.2015.06.014>
- Johnson, M. J. (2021). Impacts of Cyanide Fishing on Coral Bleaching Events. In B. H. Lower, T. R. Shaul, K. A. Shaul, & E. M. Weaver (Eds.), *Environmental Sciencebites Volume 2*. School of Environmental and Natural Resources, The Ohio State University. <https://ohiostate.pressbooks.pub/sciencebitesvolume2/chapter/3-4-impacts-of-cyanide-fishing-on-coral-bleaching-events/>
- Kathiresan, K., & Alikunhi, N. M. (2011). Tropical Coastal Ecosystems: Rarely Explored for their Interaction! *Ecologia*, 1(1), 1-22. <https://doi.org/10.3923/ecologia.2011.1.22>
- Kennedy, E. V., Vercelloni, J., Neal, B. P., Ambariyanto, Bryant, D. E. P., Ganase, A., Gartrell, P., Brown, K., Kim, C. J. S., Hudatwi, M., Hadi, A., Prabowo, A., Prihatinningsih, P., Haryanta, S., Markey, K., Green, S., Dalton, P., Lopez-Marcano, S., Rodriguez-Ramirez, A., . . . Hoegh-Guldberg, O. (2020). Coral Reef Community Changes in Karimunjawa National Park, Indonesia: Assessing the Efficacy of Management in the Face of Local and Global Stressors. *Journal of Marine Science and Engineering*, 8(10). <https://doi.org/10.3390/jmse8100760>
- Kitchin, R., & Tate, N. J. (2000). *Conducting Research into Human Geography: Theory, Methodology & Practice*. Pearson Education Limited.
- Kitolelei, J. V., & Sato, T. (2016). Analysis of Perceptions and Knowledge in Managing Coastal Resources: A Case Study in Fiji. *Frontiers in Marine Science*, 3, 189. <https://doi.org/10.3389/fmars.2016.00189>
- Lau, J. D., Hicks, C. C., Gurney, G. G., & Cinner, J. E. (2019). What matters to whom and why? Understanding the importance of coastal ecosystem services in developing coastal communities. *Ecosystem Services*, 35, 219-230. <https://doi.org/10.1016/j.ecoser.2018.12.012>
- Liquete, C., Piroddi, C., Drakou, E., J., M. L., Katsanevakis, S., Charef, A., & Egoh, B. N. (2013). Current Status and Future Prospects for the Assessment of Marine and Coastal



- Ecosystem Services: A Systematic Review. *PLoS ONE*, 8(7), e67737. <https://doi.org/10.1371/journal.pone.0067737>
- Lise, W. (2000). Factors influencing people's participation in forest management in India. *Ecological Economics*, 34, 379-392. [https://doi.org/10.1016/S0921-8009\(00\)00182-8](https://doi.org/10.1016/S0921-8009(00)00182-8)
- MacDonald, J. (2018). *Why We Need Seagrass*. JSTOR Daily. Retrieved 18 November 2022 from <https://daily.jstor.org/why-we-need-seagrass/>
- Mahajan, S. L., & Daw, T. (2016). Perceptions of ecosystem services and benefits to human well-being from community-based marine protected areas. *Marine Policy*, 74, 108-119. <https://doi.org/10.1016/j.marpol.2016.09.005>
- Matta, J. R., & Alavalapati, J. R. R. (2006). Perceptions of collective action and its success in community based natural resource management: An empirical analysis. *Forest Policy and Economics*, 9, 274-284. <https://doi.org/10.1016/j.forpol.2005.06.014>
- McCulloch, M., Fallon, S., Wyndham, T., Hendy, E., Lough, J., & Barnes, D. (2003). Coral record of increased sediment flux to the inner Great Barrier Reef since European settlement. *Nature*, 421, 727-730. <https://doi.org/10.1038/nature01361>
- McMillen, H. L., Ticktin, T., Friedlander, A., Jupiter, S. D., Thaman, R., Campbell, J., Vietayaki, J., Giambelluca, T., Nihmei, S., Rupeni, E., Apis-Overhoff, L., Aalbersberg, W., & Orcherton, D. F. (2014). Small islands, valuable insights: systems of customary resource use and resilience to climate change in the Pacific. *Ecology and Society*, 19(4), 44. <https://www.jstor.org/stable/26269694>
- McShane, T. O., Hirsch, P. D., Trung, T. C., Songorwa, A. N., Kinzig, A., Monteferri, B., Muntekanga, D., Thang, H. V., Dammert, J. L., Pulgar-Vidal, M., Welch-Devine, M., Brosius, J. P., Coppolillo, P., & O'Connor, S. (2011). Hard choices: Making trade-offs between biodiversity conservation and human well-being. *Biological Conservation*, 144, 966-972. <https://doi.org/10.1016/j.biocon.2010.04.038>
- MEA (Millennium Ecosystem Assessment). (2003). *Ecosystems and Human Well-being*. Island Press. <https://www.millenniumassessment.org/en/Framework.html>
- MEA (Millennium Ecosystem Assessment). (2005). *Ecosystems and Human Well-Being: Current State and Trends, Volume I* (R. Hassan, R. Scholes, & N. Ash, Eds.). Island Press.
- Mills, J., Gibbon, D., Ingram, J., Reed, M., Short, C., & Dwyer, J. (2011). Organising Collective Action for Effective Environmental Management and Social Learning in Wales. *Journal of Agricultural Education and Extension*, 17(1), 69-83. <https://doi.org/https://doi.org/10.1080/1389224X.2011.536356>
- Moberg, F., & Folke, C. (1999). Ecological goods and service of coral reef ecosystems. *Ecological Economics*, 29(2), 215-233. [https://doi.org/10.1016/S0921-8009\(99\)00009-9](https://doi.org/10.1016/S0921-8009(99)00009-9)
- Mohamad, M. M., Sulaiman, N. L., Sern, L. C., & Salleh, K. M. (2015). Measuring the Validity and Reliability of Research Instruments. *Procedia - Social and Behavioral Sciences*, 204, 164-171. <https://doi.org/10.1016/j.sbspro.2015.08.129>
- Mühlig-Hofmann, A., Veitayaki, J., Polunin, N. V. C., Stead, S., & Graham, N. A. J. (2004). *Community-based marine resource management in Fiji - from yesterday to tomorrow*. Proceedings of the 10th International Coral Reef Symposium, Okinawa, Japan.
- Munro, J. J. (1984). Coral reef fisheries and world fish production. *ICLARM Newsletter*, 7, 3-4.
- Naderifar, M., Goli, H., & Ghaljaie, F. (2017). Snowball Sampling: A Purposeful Method of Sampling in Qualitative Research. *Strides in Development of Medical Education*, 14(3), e67670. <https://doi.org/10.5812/sdme.67670>
- Nafiyanti, S. (2022, 3 October 2022). Limbah Tambak Udang Bisa Merusak Terumbu Karang Karimunjawa di Jepara: Ini Penjelasannya. *Suara Merdeka Muria*.

- <https://muria.suaramerdeka.com/muria-roya/pr-075007281/limbah-tambak-udang-bisa-merusak-terumbu-karang-karimunjawa-di-jepara-ini-penjasannya>
- Nagelkerken, I., van der Velde, G., Gorissen, M. W., Meijer, G. J., van't Hof, T., & den Hartog, C. (2000). Importance of Mangroves, Seagrass Beds and the Shallow Coral Reef as a Nursery for Important Coral Reef Fishes, Using a Visual Census Technique. *Estuarine, Coastal and Shelf Science*, 51, 31-34. <https://doi.org/10.1006/ecss.2000.0617>
- Natcher, D. C., Davis, S., & Hickey, C. G. (2005). Co-Management: Managing Relationships, Not Resources. *Human Organization*, 64(3), 240-250. <https://www.jstor.org/stable/44127318>
- National Science Foundation. (2016). *Too much algae - and too many microbes - threaten coral reefs*. Retrieved 25 February 2023 from <https://beta.nsf.gov/news/too-much-algae-too-many-microbes-threaten-coral>
- Nittrouer, C. A., Brunskill, G. J., & Figueiredo, A. G. (1995). Importance of tropical coastal environments. *Geo-Marine Letters*, 15, 121-126. <https://doi.org/10.1007/BF01204452>
- NWF (National Wildlife Federation). (n.d.). *Ecosystem Services*. Retrieved 2 March 2023 from <https://www.nwf.org/Educational-Resources/Wildlife-Guide/Understanding-Conservation/Ecosystem-Services>
- Odum, H. T., & Odum, E. P. (1955). Trophic Structure and Productivity of a Windward Coral Reef Community on Eniwetok Atoll. *Ecological Monographs*, 25(3), 291-320. <https://doi.org/10.2307/1943285>
- Ojha, H. R., Ford, R., Keenan, R. J., Race, D., Vega, D. C., Baral, H., & Sapkota, P. (2016). Delocalizing Communities: Changing Forms of Community Engagement in Natural Resources Governance. *World Development*, 87, 274-290. <https://doi.org/10.1016/j.worlddev.2016.06.017>
- Ostrom, E. (1990). *Governing the commons: the evolution of institutions for collective action*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511807763>
- Ostrom, E. (2009). A General Framework for Analyzing Sustainability of Social-Ecological Systems. *Science*, 325(5939), 419-422. <https://doi.org/10.1126/science.1172133>
- Plaisance, L., Caley, M. J., Brainard, R. E., & Knowlton, N. (2011). The Diversity of Coral Reefs: What Are We Missing? *PLoS ONE*, 6(10), e25026. <https://doi.org/10.1371/journal.pone.0025026>
- Pomeroy, R. S., & Berkes, F. (1997). Two to tango: the role of government in fisheries co-management. *Marine Policy*, 21(5), 465-480. [https://doi.org/10.1016/S0308-597X\(97\)00017-1](https://doi.org/10.1016/S0308-597X(97)00017-1)
- Potts, T., Pita, C., O'Higgins, T., & Mee, L. (2016). Who cares? European attitudes towards marine and coastal environments. *Marine Policy*, 72, 59-66. <https://doi.org/10.1016/j.marpol.2016.06.012>
- Pretty, J. (2003). Social capital and the collective management of resources. *Science*, 302, 1912-1914. <https://doi.org/10.1126/science.1090847>
- Purwanti, F. (2008). *Konsep Co-Management Taman Nasional Karimunjawa* [Dissertation, Institut Pertanian Bogor]. Bogor.
- Purwanti, F., Alikodra, H. S., Basuni, S., & Soedharma, D. (2008). Pengembangan Co-Management Taman Nasional Karimunjawa. *Ilmu Kelautan*, 13(3), 159-166.
- Rafferty, J. P. (2013). Coral Triangle. In *Encyclopedia Britannica*.
- Rani, D. I. S., Wijayanto, I., Indarjo, A., & Susilowati, I. (2019). Implementation of "Co-management" for Coastal Resources Management in Karimunjawa Islands, Jepara. *Indonesian Journal of Coastal and Marine Resources*, 15(2), 99-104. <https://doi.org/10.14710/ijfst.15.2.99-104>

- Rustam, A., Ningsih, Y. P. R., Suryono, D. D., Daulat, A., & Salim, H. L. (2019). Dinamika Struktur Komunitas Lamun Perairan Kepulauan Karimunjawa, Kabupaten Jepara. *Jurnal Kelautan Nasional*, 14(3), 179-190. <https://doi.org/10.15578/jkn.v14i3.7761>
- Schröter, M., Ring, I., Schröter-Schlaack, C., & Bonn, A. (2019). The Ecosystem Service Concept: Linking Ecosystems and Human Wellbeing. In M. Schröter, A. Bonn, S. Klotz, R. Seppelt, & C. Baessler (Eds.), *Atlas of Ecosystem Services*. Springer, Cham. [https://doi.org/10.1007/978-3-319-96229-0\\_2](https://doi.org/10.1007/978-3-319-96229-0_2)
- Scott, J., & Marshall, G. (2000). *A Dictionary of Sociology*. Oxford University Press.
- Setiawan, M. Y. (2023). SAH! Pemkab Jepara Pastikan Tutup Semua Usaha Tambak Udang Karimunjawa. *Tribun Muria*. <https://muria.tribunnews.com/2023/03/15/sah-pemkab-jepara-pastikan-tutup-semua-usaha-tambak-udang-karimunjawa?page=2>
- Silvestri, S., & Kershaw, F. (2010). *Framing the flow: Innovative Approaches to Understand, Protect, and Value Ecosystem Services across Linked Habitats*. UNEP World Conservation Monitoring Centre.
- Smith, S. V. (1978). Coral-reef area and the contributions of reefs to processes and resources of the world's oceans. *Nature*, 273, 225-226. <https://doi.org/10.1038/273225a0>
- Spangenberg, J. H., Görg, C., Truong, D. T., Tekken, V., Bustamante, J. V., & Settele, J. (2014). Provision of ecosystem services is determined by human agency, not ecosystem functions. Four case studies. *International Journal of Biodiversity Science, Ecosystem Services & Management*, 10(1), 40-53. <https://doi.org/10.1080/21513732.2014.884166>
- Steins, N. A., & Edwards, V. M. (1999). Collective Action in Common-Pool Resource Management: The Contribution of a Social Constructivist Perspectives to Existing Theories. *Society & Natural Resources*, 12(6), 539-557. <https://doi.org/10.1080/089419299279434>
- Sugio, R. A. (2020). *Marine Protected Area Management and Household Food Security in Karimunjawa National Park Indonesia* [Dissertation, University of Western Australia]. Western Australia.
- Suharti, S., Darusman, D., Nugroho, B., & Sundawati, L. (2022). Conditions for Successful Local Collective Action in Mangrove Forest Management: Some Evidences from Eastern Coastal Area of South Sulawesi, Indonesia. *IOP Conference Series: Earth and Environmental Science*(1027), 012024. <https://doi.org/10.1088/1755-1315/1027/1/012024>
- Tallis, H., Kareiva, P., Marvier, M., & Chang, A. (2008). An ecosystem services framework to support both practical conservation and economic development. *The Proceedings of the National Academy of Sciences*, 105(28), 9457-9464. <https://doi.org/10.1073/pnas.0705797105>
- Taruc, S. A. K. (2011). *Resilience studies of an Indonesian coral reef: Ecological and social assessments in Karimunjawa National Park* [Master's Thesis, University of Queensland]. Brisbane.
- Thakur, S., & Chetty, P. (2020). *How to establish the validity and reliability of qualitative research?* Retrieved 21 March 2023 from <https://www.projectguru.in/how-to-establish-the-validity-and-reliability-of-qualitative-research/>
- The National Geographic Society. (2022). *Marine Ecosystems*. National Geographic Society. <https://education.nationalgeographic.org/resource/marine-ecosystems>
- TNC (The Nature Conservancy). (2020). *The Importance of Mangroves*. Retrieved 18 November 2022 from <https://www.nature.org/en-us/about-us/where-we-work/united-states/florida/stories-in-florida/why-mangroves-important/#:~:text=Mangroves%20are%20important%20to%20people,weather%20events%20such%20as%20hurricanes.>

- Townsend, M., Thrush, S. F., & Carbines, M. J. (2011). Simplifying the complex: an 'Ecosystem Principles Approach' to goods and services management in marine coastal ecosystems. *Marine Ecology Progress Series*, 434, 291-301. <https://doi.org/10.3354/meps09118>
- UNEP (United Nations of Environment Programme). (1992). *The World Environment 1972-1992: Two decades of challenge*. Chapman & Hall.
- UNEP (United Nations of Environment Programme). (2006). *Marine and Coastal Ecosystems and Human Well-Being: A synthesis report based on the findings of the Millennium Ecosystem Assessment*.
- Vizzini, S. (2009). Analysis of the trophic role of Mediterranean seagrasses in marine coastal ecosystems: a review. *Botanica Marina*, 52, 383-393. <https://doi.org/10.1515/BOT.2009.056>
- Waycott, M., Duarte, C. M., Carruthers, T. J. B., Orth, R. J., Dennison, W. C., Olyarnik, S., Calladine, A., Fourqurean, J. W., Heck, K. L., Hughes, A. R., Kendrick, G. A., Kenworthy, W. J., Short, F. T., & Williams, S. L. (2009). Accelerating loss of seagrass across the globe threatens coastal ecosystems. *Proceedings of the National Academy of Sciences*, 106(30), 12377-12381. <https://doi.org/10.1073/pnas.090562010>
- Wibowo, B. A., Aditomo, A. B., & Prihantoko, K. E. (2017). Community Participation Of Coastal Area On Management Of National Park, Karimunjawa Island. *IOP Conference Series: Earth and Environmental Science*, 116. <https://doi.org/10.1088/1755-1315/116/1/012051>
- Willemen, L. (2010). *Mapping and Modelling Multifunctional Landscapes* [Dissertation, Wageningen University].
- Woodhead, A. J., Hicks, C. C., Norström, A. V., Williams, G. J., & Graham, N. A. J. (2018). Coral reef ecosystem services in the anthropocene. *Functioning Ecology*, 33(6), 1023-1034. <https://doi.org/10.1111/1365-2435.13331>
- Worthington, T. A., zu Ermgassen, P. S. E., Friess, D. A., Krauss, K. W., Lovelock, C. E., Thorley, J., Tingey, R., Woodroffe, C. D., Bunting, P., Cormier, N., Lagomasino, D., Lucas, R., Murray, N. J., Sutherland, W. J., & Spalding, M. (2020). A global biophysical typology of mangroves and its relevance for ecosystem structure and deforestation. *Scientific Reports*, 10, 14652. <https://doi.org/10.1038/s41598-020-71194-5>
- WWF (World Wildlife Fund). (2011). *INFOGRAPHIC: Marine Protected Areas in the Coral Triangle*. Retrieved 18 November 2022 from [https://wwf.panda.org/wwf\\_news/?201819/Infographic-Marine-Protected-Areas-in-the-Coral-Triangle](https://wwf.panda.org/wwf_news/?201819/Infographic-Marine-Protected-Areas-in-the-Coral-Triangle)
- Zaga-Mendez, A., Bissonnette, J., Kolinjivadi, V., Cleaver, F., & Dupras, J. (2021). Towards collective action in ecosystem services governance: The recognition of social interdependencies in three collective agri-environmental initiatives in Quebec. *Ecosystem Services*, 51, 101357. <https://doi.org/10.1016/j.ecoser.2021.101357>

## **APPENDICES**

---



## **APPENDIX 1: Interview Guideline**

1. Regarding coastal resources (especially mangrove, seagrass, and coral reefs)
  - a. What do they think about those resources?  
*\*in general*
  - b. What importance do these resources hold for them?  
*\*perhaps related to their occupation – fishermen, tourist guides, etc.*
  - c. Other than to fulfill their daily needs, do these resources benefit them in other ways other than economically?  
*\*perhaps there is a certain culture or beliefs that they hold, which are directly related to these resources*
2. How do they utilize these resources?
  - a. How long have they been dependent on these resources?
3. Are they aware of the threats that these resources face?
  - a. How are their understanding of the threats that these resources are facing?
  - b. Does their understanding of these threats lead them to conduct different ways of harvesting or utilizing these resources?  
*\*perhaps they changed their method of harvesting to a more sustainable way of harvest*  
*\*or perhaps they do not change their ways because what they do is already sustainable*
4. Are there any community groups or institutions formed as forums for communication between community members?
  - a. What is the background to the formation of these groups?  
*\*why were these groups formed?*
  - b. Who are the members of these groups?  
*\*what are the backgrounds of the members? What are their occupations?*
  - c. What are the main missions of these groups?  
*\*what is the goal of having these groups?*  
*\*what kinds of activities or actions have been carried out by the groups?*
5. Has there been any collective actions implemented within the community?
  - a. Who initiated the actions?  
*\*were the community members the ones who initiated the actions? Maybe the local groups, or KNPA? Or were there non-local actors who initiated?*
  - b. From what kind of backgrounds were the participants of these actions?
  - c. Why were these actions necessary?  
*\*what triggers the need to carry out these actions?*

6. What kinds of conflicts occurred during the planning or the implementation of these actions

*\*because of different opinions, different interests, etc.*

7. How were these conflicts resolved?

*\*or were they left unresolved; if so, why?*



## **APPENDIX 2: Letter of Consent – NSD Format**

**Are you interested in taking part in the research project?**

### **Capturing Local Communities' Perspectives on Tropical Coastal Biodiversity and Ecosystem Services**

This is an inquiry about participation in a research project where the main purpose is to understand the perspectives of local communities who are dependent on coastal and marine resources on biodiversity and ecosystem services given by those resources. In this letter we will give you information about the purpose of the project and what your participation will involve.

#### **Purpose of the project**

This project is to fulfill the requirement to complete a master's thesis, which is aimed to investigate:

1. The perceptions of local communities in Karimunjawa on marine and coastal resources and the ecosystem services they provide;
2. Both the common interests and conflicting interests on the utilization of marine resources;
3. How local communities in Karimunjawa collaborate in any ways to establish initiatives focusing in conservation and sustainable use of marine resources.

#### **Who is responsible for the research project?**

Name of researcher : Diwyacitta Dirda Gupita  
University address : NTNU, Department of Geography  
NO-7491 Trondheim  
Norway  
Phone number/Fax : 082141371627  
E-mail : diwyacig@stud.ntnu.no

#### **Why are you being asked to participate?**

Since this study focuses on local communities, the respondents are selected based on their membership to said communities. From each community, 5 people will be selected and interviewed. It is possible for one member to recommend another member if that particular person is deemed relevant and able to provide answers for the interview.

#### **What does participation involve for you?**

This study will incorporate a combination of *structured open-ended interview* and *informal conversational interview* to gather information from conversations within and between various research communities. The interviewer will ask you several questions that have been prepared beforehand; you are free to answer the question however you'd like. I will then document the interview by writing down important points based on your answers.

Aside from interviews, this study will also incorporate participation observation, in which the researchers participate in certain daily activities of the observed subjects – such as coming along in a fishing trip, or participating in a collective action conducted in a certain time during the study timeline (if there are any).

### **Participation is voluntary**

Participation in the project is voluntary. If you chose to participate, you can withdraw your consent at any time without giving a reason. All information about you will then be made anonymous. There will be no negative consequences for you if you chose not to participate or later decide to withdraw.

### **Your personal privacy – how we will store and use your personal data**

All personal information (name, age, education level, position in certain organization/community/ group, phone number, ID number, etc.) tied to all respondents will not be included in the report of this study. We will only use your personal data for the purpose(s) specified in this information letter. We will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

- The only person responsible for these data is me.
- The data will be stored in my personal computer which is securely protected by a password accessible only to me.

### **What will happen to your personal data at the end of the research project?**

The project is scheduled to end on June 2023, which is after I have submitted my thesis manuscript to the university. After the end of the project, the data will still be stored for future studies, including possible publications – but your personal information will still be omitted. The data includes sound recordings taken during interviews, which are only accessible only to me, therefore no other person have access to personal data exposed in the recordings; and also, any notes taken during the interview and participant observation. All data will be stored for the next 3 months after the end of my project. After that, all data will be deleted.

### **Your rights**

So long as you can be identified in the collected data, you have the right to:

- access the personal data that is being processed about you
- request that your personal data is deleted
- request that incorrect personal data about you is corrected/rectified
- receive a copy of your personal data (data portability), and
- send a complaint to the Data Protection Officer or The Norwegian Data Protection Authority regarding the processing of your personal data

### **What gives us the right to process your personal data?**

We will process your personal data based on your consent.

Based on an agreement with Norwegian University of Science and Technology, Data Protection Services has assessed that the processing of personal data in this project is in accordance with data protection legislation.

### **Where can I find out more?**

If you have questions about the project, or want to exercise your rights, contact:

- Norwegian University of Science and Technology via Prof. Ståle Angen Rye (Project leader) or Diwyacitta Dirda Gupita (Master's student).
- Our Data Protection Officer: Thomas Helgesen (Data Protection Officer NTNU)
- Data Protection Services, by email: ([personverntjenester@sikt.no](mailto:personverntjenester@sikt.no)) or by telephone: +47 53 21 15 00.

Yours sincerely,

Ståle Angen Rye  
(Researcher/supervisor)

Diwyacitta Dirda Gupita  
(Master's student)

---

## Consent form

I have received and understood information about the project *[insert project title]* and have been given the opportunity to ask questions. I give consent:

- to participate in the interview
- to participate in the participant observation
- for my interview data to be processed
- for my interview data to be stored after the end of the project for future research purposes

I give consent for my personal data to be processed until the end date of the project, approximately until 30 June 2023

---

(Signed by participant, date)



### **APPENDIX 3: Letter of Consent – BRIN Format**

#### ***Capturing Local Communities' Perspectives on Tropical Coastal Biodiversity and Ecosystem Services***

##### **LETTER OF CONSENT**

I am a student from Norwegian University of Science and Technology is conducting a study with the title: **Capturing Local Communities' Perspectives on Tropical Coastal Biodiversity and Ecosystem Services**. In this study I will interview a number of respondents that are selected randomly. You are selected as a respondent in this study. The interview/survey will take about 20 minutes.

I guarantee that any information you submit will be kept confidential. Your name or any information that might identify you in the study report will not be used.

Your participation is completely voluntary. You have the right to withdraw your participation at any time, or to refuse to answer some of the questions. If you have any questions regarding this study, please do not hesitate to ask the researcher who conduct the interview/survey.

If you have any questions regarding this study at a later date, you may contact the research coordinator:

Name of research coordinator	: Diwyacitta Dirda Gupita
University address	: NTNU, Department of Geography NO-7491 Trondheim Norway
Phone number/Fax	: 082141371627
E-mail	: diwyacig@stud.ntnu.no



Norwegian University of  
Science and Technology