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EXPLORING SOCIAL RESILIENCE IN MARINE PROTECTED AREAS – A CASE OF INDONESIA'S CORAL TRIANGLE

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ABSTRACT

The term “resilience” has a very long and rich history. The term itself received a widespread attention since Holling’s seminal paper in 1973 on system ecology. Since then, the term resilience has been widely used and defined in many academic disciplines. The examination of social resilience in the context of overall coastal community resilience has been developed during the last few years. Such studies have been important in determining factors influencing the acceptance of MPAs in resource dependent communities.

The concept of social resilience has been defined mostly at the community level, and less so at the individual level. In order to fill the gap, this study is intended to measure social resilience at the individual level. The objective of this study is to explore resilience and its impact on Indonesian MPAs. It addresses the following research questions: (1) What is the degree of variability in individual resilience in Indonesia’s Coral Triangle?, (2) Are there any relationships between degree of individual resilience and other social characteristics of a community?, (3) Are there any relationships between degree of individual resilience and a community’ economic characteristics? (4) Are there any relationships between degree of individual resilience and community members’ environmental attitudes beliefs and values?, and (5) How does community perception of MPA management influence their degree of individual resilience?

This study has discovered some important aspects of social resiliency and it’s relation to some aspects of MPAs. First, the social resilience of resource dependent

individuals in Indonesia could be best explained by five components, which are: adaptive capacity, risk awareness, perceived social-economic status, community attachment and environmental awareness. Second, this study suggests that MPAs have some degree of influence on the level of individual social resilience. Several resource users' individual attributes, such as age, years of education and gender are related to their level of social resilience. Resource user's perceptions of some aspects of MPA planning and management processes were also found related to their social resilience. Finally, this study provides a basis for further in depth research of social resilience of resource dependent communities, specifically in the Indonesian context.

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CHAPTER 1

INTRODUCTION

Indonesia is the world's largest archipelagic state. It has a very complex geology, climate and ocean circulation patterns, which result in a highly diverse and dynamic marine and coastal environment (Tomascik et al. 1997). The population of Indonesia is approximately 240 million (in 2010), and nearly 60 million people live along the coast within 30 km from coral reefs (Burke et al. 2012). In order to optimize the benefits of marine and coastal resources, the government of Indonesia has rapidly expanded the extent of marine waters under protection. To date, approximately 170,000 sq. km of Indonesia's marine and coastal area has been protected with some form of marine conservation arrangement. The government of Indonesia is currently continuing to establish more conservation areas to fulfill the 200,000 sq km commitment by 2020 to the Coral Triangle Initiative – CTI (Green et al. 2012; Carter et al. 2010).

Marine Protected Areas (MPAs) have a significant role to play in the protection of ecosystems and, often, in the enhancement or restoration of coastal and marine fisheries, if they are correctly designed and effectively managed (Carter et al. 2010; IUCN-WCPA, 2008). MPAs consist of a complex combination of governing arrangements managing the interactions of humans with the natural environment (Dalton 2012). However, MPAs' implementation can cause major changes to an

individual's (i.e. resource users) life and coastal communities' interaction as the result of restricting resource utilization, for protection and conservation. The coastal communities will have to be able to adapt to such changes. Their adaptation involves making adjustments to changing circumstances in order to endure the changes (Hanna, 2000).

The theory of resilience has been undergoing development for about four decades (Holling 1973; 2004). Resilience refers to a system that maintains social – ecological functions, with the ability to absorb change or perturbation and reorganize so as to maintain essentially the same function, structure, identity and feedbacks (Marshall, 2006). Resilience is the ability of a social-ecological system to cope with and adapt to external social, political, or environmental disturbances (Adger 2000, Folke et al. 2002a, Marshall and Marshall 2007, Cinner et al. 2009). During, the last ten years, efforts to apply the resilience concept to marine conservation have significantly increased (Hughes et al. 2005, Cinner et al. 2009, Marshall et al. 2009, Sutton and Tobing 2012, Cinner et al. 2012, McClanahan et al. 2012).

Social resilience, as one of the essential components of resilience theory, has been developed in the context of anthropological and medical research (Vayda and McCay 1975; Rutter 1987; Abel and Stepp 2003; Bonanno, G.A. 2004). The examination of social resilience in the context of overall coastal community resilience has been developed during the last few years. Such studies have been important in determining factors influencing the acceptance of MPAs in resource dependent communities (Marshal 2007; Marshall and Marshall 2007; Cinner et al. 2009; Marshall et al. 2009; McClanahan et al. 2012; Sutton and Tobing 2012).

The concept of social resilience has been defined mostly at the community level (Levin et al. 1998, Adger 2000, McClanahan et al. 2008, Cinner et al. 2009), and less so at the individual level (Marshall and Marshall 2007, Marshall et al. 2009, Sutton and Tobing 2012). In order to fill the gap, this study is intended to measure social resilience at the individual level. Moreover, for the purpose of this study, general use of the term 'resilience' refers to individual resilience—the adaptability of individual resource users to changes and perturbations in their community and ecosystem, while community resilience is the degree to which all community members are resilient.

The objective of this study is to explore resilience and its impact on Indonesian MPAs. It will address the following research questions:

1. *What is the degree of variability in individual resilience in Indonesia's Coral Triangle?*
2. *Are there any relationships between degree of individual resilience and other social characteristics of an individual?*
3. *Are there any relationships between degree of individual resilience and an individual's economic characteristics?*
4. *Are there any relationships between degree of individual resilience and individual's environmental attitudes, beliefs and values?*
5. *How does community perception of MPA management and implementation influence their degree of individual resilience?*

This study will improve the understanding of individual resilience and its influencing factors as associated with MPAs in Indonesia's Coral Triangle region. It is also aimed to provide input to MPA officials and managers to develop strategies for better adaptive management of MPAs in Indonesia.

The next chapter provides a summary of current theory regarding resilience and social resilience, including social and economic characteristics that have been found to influence social resilience, and its potential influence on MPA management. Chapter 3 provides a description of the methods used for data collection and analysis. Chapter 4 presents the results. Chapter 5 discusses key findings, management implications and potential areas for improvement. Chapter 6 presents the study's conclusion.

CHAPTER 2

REVIEW OF LITERATURE

2.1. RESILIENCE CONCEPT REVISITED

Resilience theory has been developed over the last few decades. The resilience perspectives surfaced over a theory of ecological stability resulting from studies of population interaction related to the predator--prey mechanisms in the field of ecology (Folke 2006). C.S. Holling (1973) initially utilizes the concept of 'resilience' in ecology in his seminal paper. "The resilience approach emphasizes non-linear dynamics, thresholds, uncertainty and surprise, how periods of gradual change interplay with periods of rapid change and how such dynamics interact across temporal and spatial scales" (Folke 2006: 253).

The resilience perspective is constantly evolving and used in a great variety of interdisciplinary works concerned with the interaction between humans and nature (Carpenter et al. 2001, Folke 2006). The concept and associated theory began to influence other fields such as anthropology and other social sciences (Vayda and McCay 1975, McCay 1978, Thompson et al. 1990, Hanna et al. 1996, Scoones 1999, Abel and Stepp 2003), ecological economics (Perrings et al. 1992, Costanza et al. 1993, Arrow et al. 1995), community planning (Lamson 1986, King 1997), disaster and hazard (Tobin 1999), geography (Zimmerer 1994), and public health (Dyer and McGuinness 1996, Rutter 1987).

Based on the original concept from Holling's synthesis (1973), resilience has three defining characteristics in a social-ecological system, which are; (1) the extent of change (or stress) that a system can undergo (or sustain) and still maintain the same controls on its structure and function, (2) the degree to which the system is capable of self-organization, and (3) the degree to which the system can build and increase the capacity for learning and adaptation (Carpenter et al. 2001, Walker et al. 2002, Folke et al. 2002a,b). The sequence of resilience concept development is summarized in Table 2.1 (Adapted from Folke 2006).

Table 2.1: A sequence of resilience concepts, from more narrow interpretation to the broader context (Adapted from Folke 2006).

Resilience Concept	**Characteristics**	**Focus on**	**Context**
Engineering Resilience	Return time, efficiency	Recovery, constancy	Vicinity of a stable equilibrium
Ecological/Ecosystem Resilience; Social Resilience	Buffer capacity, withstand shock, maintain function	Persistence, robustness	Multiple equilibria, stability landscapes
Social-Ecological Resilience	Interplay disturbance and reorganization, sustaining and developing	Adaptive capacity, transformability, learning, innovation	Integrated system feedbacks, cross-scale dynamic interactions

2.1.1. RESILIENCE IN SOCIAL-ECOLOGICAL SYSTEMS

"Social–ecological resilience is about people and nature as interdependent systems" (Folke et al. 2010: 2). The stability dynamic of a linked systems of human and nature emerges from three complementary and interrelated attributes: (1) resilience, (2) adaptability and, (3) transformability which could determine the

system's future trajectories (Walker et al. 2004). Henceforth, Folke et al. (2010) argue that both adaptability and transformability are the prerequisite attributes for social-ecological resilience. In addition, Walker et al. (2004) emphasize four crucial aspects to define resilience in the context of social-ecological systems: (1) latitude, (2) resistance, (3) precariousness and (4) panarchy.

2.1.2. ADAPTABILITY AND ADAPTIVE CYCLE

In the social-ecological system, adaptability refers to the extent of humans' (actors') capacity to influence resilience, intentionally or unintentionally (Walker et al. 2004). The adaptability of the actors decides the level of threshold in a social-ecological system (move closer/further away or more/less difficult to reach) (Walker 2004). Moreover, Walker et al. (2004) imply that a desirable regime in the social-ecological system can be created from intentional collective actions of the actors (human) to manage the resilience following a disturbance. Berkes et al. 2003 (as cited in Folke et al. 2010:2) further explained, "adaptability captures the capacity of a social-ecological system to learn, combine experience and knowledge, adjust its responses to changing internal processes and external drivers, and continue to develop within the current stability domain or basin of attraction".

Hollings et al. (1986; 2001) presented a heuristic model for understanding the process of change in complex systems, called the adaptive cycle (Fig 2.1). It consists of four cyclic development phases and three characteristics, which "can be used to identify structure, patterns, and causality in a complex adaptive system," (Allison and Hobbs 2004:4). Four development phases of adaptive cycles are rapid growth/

exploitation (r), conservation (K), release (Ω), and reorganization (α) (Hollings et al. 1986; 2001) and the three characteristics are potential (capacity), connectedness and resilience (Allison and Hobbs 2004). Table 2.2 summarizes the relationship the four-phase and three-characteristic of the adaptive cycle (adapted from Allison and Hobbs 2004).

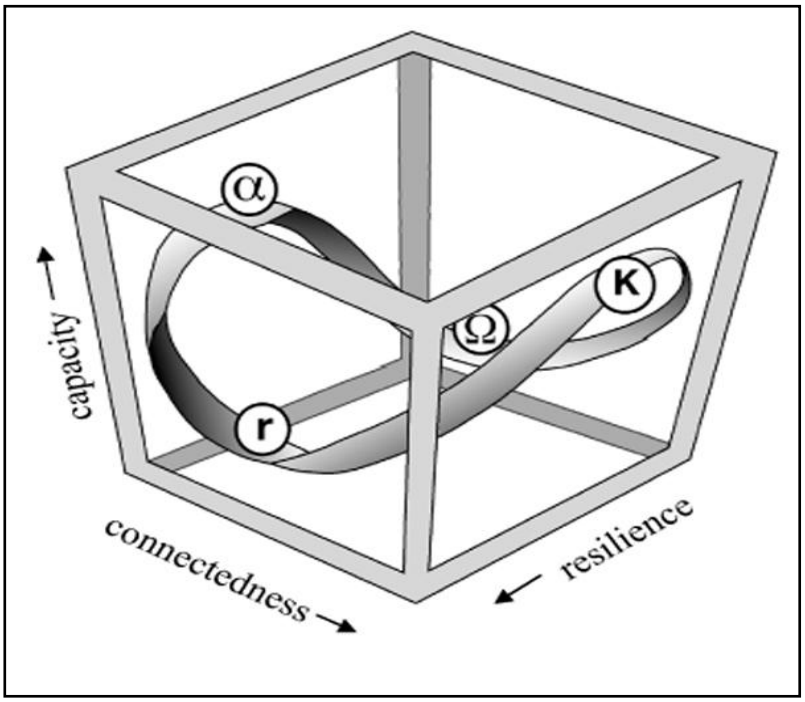

Figure 2.1: Three-dimensional heuristic model of adaptive capacity (adapted from Allison and Hobbs 2004).

The process involves an adaptive cycle triggered by a disturbance (change-event) that breaks down the system. The cycle then moves to the next phase of growth or exploitation. During this phase, new opportunities and innovations that could shape the system arise (Marshall 2006). The cycle then continues to the conservation phase. In this phase, any external disturbance may not significantly affect the system as the system becomes stagnant and less flexible (Marshall 2006). If an external disturbance

happens that exceeded the system "threshold", the system would collapse and enter the release phase of the cycle. The system would then be restructured and regrown (Holling 1973; 2004, Gunderson et al. 1995, Marshall 2006).

Table 2.2: The relationship of four-phases and three-characteristics of adaptive capacity (adapted from Allison and Hobbs 2004).

Characteristics/ Phase	Capacity	Connectedness	Resilience
Reorganization (α)	High	Low	High
Conservation (K)	High	High	Low
Growth/exploitation (r)	Low	Low	High
Release (Ω),	Low	High	Low

2.1.3. TRANSFORMABILITY

Walker et al. (2004:3) defined transformability as "the capacity to create a fundamentally new system when ecological, economic, or social (including political) conditions make the existing system untenable". It can be a deliberate or forced process by the actors (Folke et al. 2010). Several studies of social-ecological systems suggest that transformation attributes entail four stages; (1) preparing the social–ecological systems for change, (2) a crisis that creates a window of opportunity for change occurring, (3) navigating the transition of the system and (4) charting a new direction of the social-ecological system, while building resilience for the new regime (Olsson et al. 2004a; 2006, Folke et al. 2005, Chapin et al. 2010).

2.1.4. THRESHOLD

One important factor in the resilience of a social-ecological system is threshold. Thresholds are used to describe the point where a regime or an alternate stable state in a system could be changed into another regime or stable state (Walker and Meyers 2004). They further explain that in theory, when a threshold level is passed, a regime shift occurs, and as a result, the nature and extent of feedback in the system changes. In a Socio-ecological system there exists thresholds (from primary components) that could determine the trajectory of the system from a desirable into an undesirable state, if it is passed (Walker and Meyers 2004). Marshall (2006:16) explained that an adequately big change event could result a switch in the system to an alternate regime if "the thresholds of coping are reached and exceeded". She further argued "A negative shift from 'desirable' to 'undesirable' states represents loss of system resilience" (Marshall 2006:16).

Social-ecological systems have multiple interacting thresholds that are triggered by slow and fast variables (Yorque et al. 2002, Walker et al. 2006, Renaud et al. 2010). Threshold measurement is difficult and typically has low precision; very often thresholds shift over time due to the dynamic and the complexity of the systems (Walker and Meyers 2004, Walker et al. 2006, Marshall 2006, Renaud et al. 2010).

2.1.5 LATITUDE

Latitude (L) refers to "the maximum amount from a system that can be changed before losing its ability to recover" (Walker 2005:82). It is illustrated as the width of the valley of attraction (Fig. 2.2) (Walker et al. 2004). Furthermore, Walker

et al. (2004:6) suggested that wide valleys "mean a greater number of system states can be experienced without crossing a threshold."

2.1.6 RESISTANCE

Resistance (R) suggests the level of difficulties in changing the system (Walker 2005). It is "related to the typology of the basin—deep basin of attraction; (R; or more accurately, higher ratio of R:L) which indicates that greater forces of perturbation are required to change the current state of the system away from the attractor" (Walker et al. 2004: 6-7). Figure 2.2 pictured Resistance as the depth of the valley. As the valley become deeper, a greater disturbance is needed in order to move a system closer to its threshold and into another alternate state or regime (Marshall 2006).

2.1.7 PRECARIOUSNESS

Precariousness (PR) indicates the current trajectories of a system to its thresholds (Walker et al. 2004, Walker 2005). It is pictured as the distance of the dot relative to the edge of the valley (Fig. 2.2).

2.1.8 PANARCHY

Panarchy is the theory of the cross scale, interdisciplinary and dynamic nature of a social – ecological system (Holling et al. 2002, Gotts 2007). It is how the latitude, resistance and precariousness are "influenced by the states and the dynamics of the systems at scales above and below the scales of interest" (Walker et al. 2004:7).

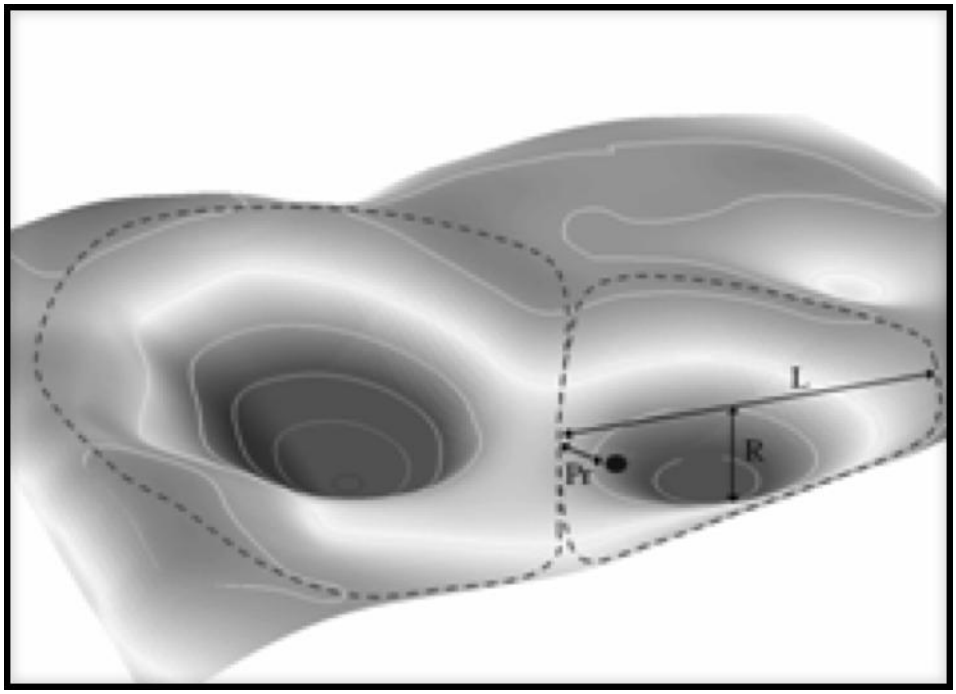

Figure 2.2: Stability landscape with two basin of attraction showing the three aspects of resilience, L = latitude, R = resistance, Pr = precariousness (Adapted from Walker et al. 2004).

2.2 SOCIAL RESILIENCE

It has been understood that the resilience of the social system linked to a larger resource system is just as important as resilience of the ecological components of the system (Berkes and Folke 1998, Gunderson and Holling, 2002, Berkes et al. 2003). Resilience is mostly specified within the context: 'of what, to what' (Carpenter et al. 2001, Walker et al. 2002). However, researchers and managers are mostly unclear about what they have set out to measure for social resilience (Marshall 2006).

In the context of human-nature interaction, social resilience is an essential element of the conditions in which individuals and/or social groups interact and adapt to any changes in the environment (Adger 2000, Marshal 2007). The dependence of

the individual and/or community on the environment through economic and livelihood activities is an example of connecting both social and ecological resilience (Adger 2000).

Researchers have attempted to define and to measure social resilience from various viewpoints. Harkes and Novaczek (2002) attempted to measure the resilience of a social system using the performance and status of a local customary institution (Sasi), while Gomez-Baggethun et al. (2012) studied the potential contribution of Traditional Ecological Knowledge (TEK) in community resilience. They measured the resilience using biological and social sustainability indicators, efficiency, equity, and the historical records of adaptive practices. Norris et al. (2008) and Sherrieb et al. (2010) measured social resilience in relation to community preparedness to disaster, while Machlis and Force 1988, Bliss et al. (1998) measured social resilience in forest dependent communities. Marshall and Marshall (2007) measured social resilience from individual perspectives, while Cinner et al. (2009) measured social resilience using household and community level information. For instance, Marshall and Marshall (2007) measured assessed resource users' social resilience from their responses of expected well-being, historic responses, capacity to anticipate change events. Moreover, Cinner et al. (2009) measured communities' social resilience from their flexibility, capacity to organize, capacity to learn, and their access to assets and infrastructures.

The definition of social resilience is heavily influenced by the original definition of resilience in the field of ecology. Adger (2000:347) offered an inclusive definition of social resilience:

> "[...] the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change."

Drawing from many definitions of social resilience, Abesamis et al. (2006:5) defined social resilience in the context of MPAs as:

> "[…] the ability to cope with changes or stress brought about by MPA establishment and management without losing their critical functions as a community concerning social relations, economic prosperity and political stability."

This definition seems to imply that an MPA might create vulnerability. However, if an MPA improves ecosystem resilience we could expect it to improve the resiliency of resources users in the adjacent areas. Moreover, these definitions highlight several dimensions of social resilience, which thus require interdisciplinary understanding and analysis at various scales.

Marshall and Marshall (2007) in their study of fishing industries in Northern Australia identified key characteristics of individual fishermen in their ability to cope and adapt to change in resource utilization policy. Such characteristics are (Marshall and Marshall 2007):

1. The perception of risk associated with change
2. The ability to plan, learn, and reorganize
3. The perception of the ability to cope, and
4. The level of interest in change.

The above-mentioned characteristics have been used in identifying and characterizing the vulnerabilities of stakeholder groups during the process of planning

for prospective Marine Protected Areas in Egypt (Marshall et al. 2009) and commercial fishers response to management change in the Great Barrier Reef Marine Park, Australia (Sutton and Tobin 2012).

Social resilience is generally considered to lie at the "flip side" of vulnerability, (Folke et al. 2002b, Gallopin 2006). Kelly and Adger (2000:328) define vulnerability as "the ability or inability of individuals or social groupings to respond to, in the sense to cope with, recover from or adapt to, any external stress placed on their livelihoods or wellbeing". Resilience depends on the system's adaptive capacity to anticipate and to minimize any forthcoming harm, while vulnerability depends on the system's sensitivity to any possible harm from exposure (Folke et al. 2002b). For instance, household occupational multiplicity provides a range of options if anyone occupation within the household should suffer from a shock, e.g. the collapse of fish stock or drought impacting farming.

2.2.1 RESOURCE DEPENDENCY AND SOCIAL RESILIENCE

The relationship between humans and the environment is complex. The complex and reciprocal relationships that humans have with their environment have been an interesting subject that many researchers are trying to address (Dunlap and Catton 1994, Bourdeau 2004). The concept of resource dependency explains the nature of the relationship between community and the environment where they live and rely upon for fulfilling their livelihood (Machlis and Force 1988, Bailey and Pomeroy 1996, Adger 2000, Brookfield et al. 2005).

The typical examples of resource dependent communities are those that are predominantly living from farming, logging, fishing, or mining (Machlis et al. 1990, Freudenburg 1992, Bailey and Pomeroy 1996, Adger 2000). The concept of resource dependency has been used to assess communities' social and economic conditions that are dependent on forest resources (Machlish and Force 1988, Little and Krannich 1988, Machlis et al. 1990) and coastal and fisheries related resources (Peluso et al. 1994, Bailey and Pomeroy 1996, Adger 2000, Brookfield et al. 2005, Marshall et al. 2007).

Resource dependency is a description of a relationship between resource users and a resource. It "relates to communities and individuals whose social order, livelihood and stability are a direct function of their resource production and localized economy" (Adger 1999:254). The dependency of individuals or communities on natural resources is not always depending on a particular resource, but in most cases it depends on a whole integrated ecosystem (Bailey and Pomeroy 1996, Adger 2000). Furthermore Adger (2000) implied that a community that is dependent on several natural resources is more resilient as compared to a community that depends only on one particular natural resource such as an underground mineral.

In the context of fisheries, Brookfield et al. (2005:57) defined a fishery dependent community as:

> "[…] a population in a specific territorial location which relies upon the fishing industry for its continued economic, social and cultural success."

How resource dependency and social resilience are related is well summarized in Adger's (2000:354) seminal paper:

> "[…] the direct dependence of communities on ecosystems is an influence on their social resilience and ability to cope with shocks, particularly in the context of food security and coping with hazards. Resilience can be undermined by high variability (or disturbance in ecological terms) in the market system or environmental system. Resilience therefore depends on the diversity of the ecosystem as well as the institutional rules which govern the social systems."

However, human systems adapt to high variability over time. For example in a fisheries dependent community, fishers employ multiple gears as a response to high seasonal and annual variability of fish abundance.

To observe and measure social resilience of communities or individuals, several social (e.g. demographic, attachment to place and family characteristics), economic (e.g. business size and approach, financial status and income source) and environmental (e.g. time spent on harvesting) attributes related to resource dependency of communities and individuals could be used (Adger 2000, Marshall et al. 2007). These attributes could positively and/or negatively affect the resiliency (Adger 2000).

2.2.2 ASSESSING SOCIAL RESILIENCE

The concept of (social) resilience, vulnerability and adaptive capacity are related in non-trivial ways (Gallopin 2006). He provided examples of the interchangeability of these concepts as follows "…Gunderson (2000) defines adaptive capacity as system robustness to changes in resilience; Carpenter et al. (2001) use

adaptive capacity as a component of resilience that reflects the learning aspect of system behavior in response to disturbance; while Walker et al. (2004) describe adaptability as the collective capacity of the human actors in an SES [Social Ecological System] to manage resilience…" (Gallopin 2006: 301).

Many researchers have attempted to assess [social] resilience at various levels and ranges of scale. For example, Adger and Vincent (2005), Vincent (2007), Nelson et al. (2008) assessed resilience at the national level while Adger (2000), Berkes and Seixas (2005), and Cinner et al. (2009) assessed at community level. Resilience has also been measured at both the household (Vincent 2007) and individual level (Marshall and Marshall 2007, Marshall et al. 2009, Sutton and Tobing 2012). In addition, Marshall et al. (2010) proposed a range of social indicators that have been developed and tested in various areas to measure the level of social resilience.

2.2.2.1 Coping Ability

In the context of social systems, the coping threshold is a measure of the proximity to psychological and financial and marital terms indicators (Marshall and Marshall 2007). Smith et al. (2003), in their study of commercial fishing families in Florida after the "net ban", found out that the policy changes had resulted in mental health impacts such as increasing level of stress, depression, anxiety and anger. Similar results also showed in the study of job satisfaction among commercial fishermen in New England by Pollnac and Poggie (1988). Their finding indicated that management decision in various aspects of fishing could have an enormous impact on the fisher's work. They further argued that negatives changes in job satisfaction have

been related to negative social impacts, such as family violence and lower worker productivity (Pollnac and Poggie 1988). Binkley's (2000) studies of families coping with the North Atlantic Fisheries' crisis in Nova Scotia's fishing-families indicated that financial well-being was an urgent problem. As a response, families engaged various short-term coping strategies to deal with financial issues such as increasing the wife's employment outside the home (Binkley 2000). This illustrates one of Marshal et al. (2010) key characteristics for measuring individual social resilience, which is livelihood diversity.

2.2.2.2 Level of Interest to Change

The level of interest to change corresponds to the degree of to which the system is capable of self-organization and the flexibility of an individual's financial, social, and emotional indicators (Marshall 2006, Marshall and Marshall 2007). Individuals that have a high-level of interest to change usually have a financial, social and/or emotional flexibility (Marshall et al. 2009). These characteristics are similar to attributes of early adopters of technological innovations (Rogers 1995).

Researchers have discussed the importance of flexibility to maintain resilience (Gunderson 1999, Carpenter and Gunderson 2001, Cinner et al. 2009). Flexibility in switching livelihood strategies is important in a social-ecological system (Berkes and Sexias 2006). Loss of flexibility indicates the inability of individual or communities to exploit and benefit from other options within the industry or community (Marshall and Marshall 2007).

2.2.2.3 The Ability to Plan, Learn and Organize

This attribute suggests the ability of the individual or community to anticipate the changing future (Marshall et al. 2009). The ability to plan, learn and organize enables people to respond to disturbances by optimizing resources outside their previous experience. Understanding the perceived role of human agency in the change process can help them plan and organize for future (Cinner et al. 2009). Furthermore, the ability to reorganize after an initial change is dependent on novelty, creativity, experimentation, learning, and planning of the actors (Colding et al. 2003, Olsson et al. 2004b, Armitage et al. 2007).

2.2.2.4 The Perception of Risk

One of the fundamental elements in social resilience is the perception of risk (Marshall and Marshall 2007). Marshall and Marshall's (2007) study of commercial fishermen in Northern Australia suggested that risk perception of policy changes could influence the way the fishermen respond. The level of perceived risk by an individual determines their ability to cope and adapt to any changes and uncertainty (Marshall et al. 2010). Bradford et al. (2012) suggested that risk perception is influenced by situational (such as demographic profiles and previous experience) and cognitive factors (reflecting personal and psychological factors of the individual).

2.3 MARINE PROTECTED AREA OVERVIEW

Most of marine environments around the world are in serious decline; anthropogenic stresses and climatic related changes have caused dramatic phase or

regime shifts, which are often long lasting and sometime irreversible (Huges et al. 2005). Common examples in coastal marine resources are the regime shift happening in coral reefs after habitat destruction and the collapse of many coastal and oceanic fisheries (Francis and Hare 1994, De Young et al. 2008, Huges et al. 2010).

These unwanted regime shifts are an indication that the system is losing its resilience, which has significant effects on organisms within the system and also for people who are dependent to such resources (Folke et al. 2004). Therefore, there has been a tremendous challenge worldwide to protect these habitats and conserve the remaining marine species that provide food, livelihood and well-being to societies (Huges et al. 2005; 2010).

A Marine Protected Area (MPA) is one of the promising tools for marine conservation and fisheries management (Tundi Agardy 1994, Dalton et al. 2012). It also serves as a link to the dynamics of social and ecological systems in the coastal waters (Pollnac et al. 2010). IUCN in Kelleher (1999: xviii) defines MPA as:

> "Any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment".

Earlier development of MPAs drew heavily from the bio-ecological perspectives with very little attention given to social and economical aspects of the community (Christie 2004). However, researchers have shown that socio-economic factors are equally important determinants of the success or the failure of MPAs (Christie et al. 2003, Mascia 2003, Wahle et al. 2003).

The management of MPAs involves some degree of restriction of human activities for resource utilization and extraction, which in most cases could create pressures and conflicts among interested stakeholders (Christie 2004). MPAs that fail to integrate the human dimension into the design and implementation processes could downplay the evolved relations of human and natural environments (Christie et al. 2003, Mascia 2003, Wahle et al. 2003). The examples of major changes brought about by MPAs are restricted resource use access, reduced fishing grounds and increased resource protection and conservation (Abesamis et al. 2006). However, in a resilient community, these changes should have the potential to generate innovation and originality among stakeholders (Folke et al. 2002b). MPA as a tool can potentially improve ecosystem resilience and therefore can be interconnected with community resilience.

2.4 SUMMARY

The resilience concept is very broad and it is indeed difficult to measure. It is a concept that incorporates all the interrelationship factors in order to understand and to assess the system. It has been used in many disciplines and has been measured in many ways. However, in order to achieve resiliency, there is a need to understand the specific context of resilience (Carpenter et al. 2001).

MPAs have been a favorable tool for managing coastal and marine areas, as it allows multiple goals at the same time. MPAs could be described as a complex system that accommodates both social and ecological goals. The management of MPAs will definitely limit some uses of resources, which could have both positive and negative

impacts. This study attempts to understand one aspect of resilience, social resilience of the resource users, within the larger context of a social – ecological system (MPA).

CHAPTER 3

METHODOLOGY

This chapter describes the methodology used in this study. It describes the study area, data collection methods, interviewing techniques and data analysis.

3.1 STUDY AREA

This study was conducted in a network of MPAs in Bali, (namely Bali MPA Network) within the Coral Triangle region of Indonesia. The Bali MPA network was initiated in 2011 and covers five coastal regencies in Bali Island (Mustika et al. 2012). There are nine priority conservation sites within the network, in which five sites have already been established as MPAs (Table 3.1).

Thirty coastal villages were selected as study sites. They are spread across four regencies within the Bali MPA network. Twenty-three study sites were associated with a managed and declared MPA, while seven villages were located in proposed sites of MPAs (Table 3.2 and Fig. 3.1). Villages were selected based on their location in the existing MPA network map (Fig. 3.1) and consultation with MPA managers and village officials. All the sample villages have a direct exposure geographically to the coastal area, and the majority of community members surveyed have activities related to coastal and marine use. Villages located within the MPAs or proposed MPAs were not surveyed if only a very limited number of their members (less than 20) have activities related to coastal and marine use, as the impact of the MPA might not be

significant on their livelihoods.

Table 3.1: Bali MPA network priority sites (clock-wise eastward) (Adapted from Mustika et al. 2012)

No.	Site Name	Location (Regency)	Biological Characteristic	Management Status[1]
1.	Nusa Penida	Klungkung	Coral reef, mangroves, reef fish, cetaceans, whale shark, sea turtles, shark, manta, sunfish	Declared as an MPA*
2.	Padang Bai – Candidasa	Karangasem	Coral reef	n.a.
3.	Amed – Tulamben	Karangasem	Coral reef, reef fish, sea turtle, shark	n.a.
4.	East Buleleng MPA	Tejakula, Buleleng	Coral reef, reef fish, whale shark	Declared as an MPA**
5.	Central Buleleng MPA	Lovina, Buleleng	Coral reef, reef fish, cetacean, whale shark	Declared as an MPA**
6.	West Buleleng MPA	Pamuteran, Buleleng	Coral reef, reef fish, seas turtle	Declared as an MPA**
7.	Bali Barat National Park	West Bali, Buleleng	Coral reef, reef fish, sea turtle, cetaceans	An Official MPA***
8.	Perancak	Negara	Sea turtle, mangrove	n.a.
9.	The peninsula (Including Nusa Dua and Bukit Uluwatu)	Badung	Coral reef, reef fish, cetacean, sea turtle	n.a.

Note: * Declared in September 2010
** Declared in August 2011
*** Declared in September 2005

Table 3.2: Study sites

Regency (MPA)	Number of Sites	Village Name
Klungkung (Nusa Penida)	7	Nusa Lembongan, Jungut Batu, Toya Pakeh, Ped, Kutampi Kaler, Batunuggul, Suana
Buleleng (East, Cental, West Buleleng and West Bali National Park)	16	Tembok, Penuktukan, Less, Tejakula, Bon Dalem, Pacung, Anturan, Kali Bukbuk, Kali Asem, Temukus, Pengastulan, Den Carik, Pamuteran, Sumber Kima, Pejarakan, Sumber Kelampok.
Negara	3	Air Kuning, Perancak, Pengambengan
Badung	4	Bualu, Kutuh, Kedonganan, Jimbaran

[1] The difference between a declared and an official MPA is the organizational and management structure of the MPAs. A declared MPA is an MPA that has been declared but doesn't necessarily have a complete management and organizational structure, while an official MPA is an MPA that has a clear organization and management structure.

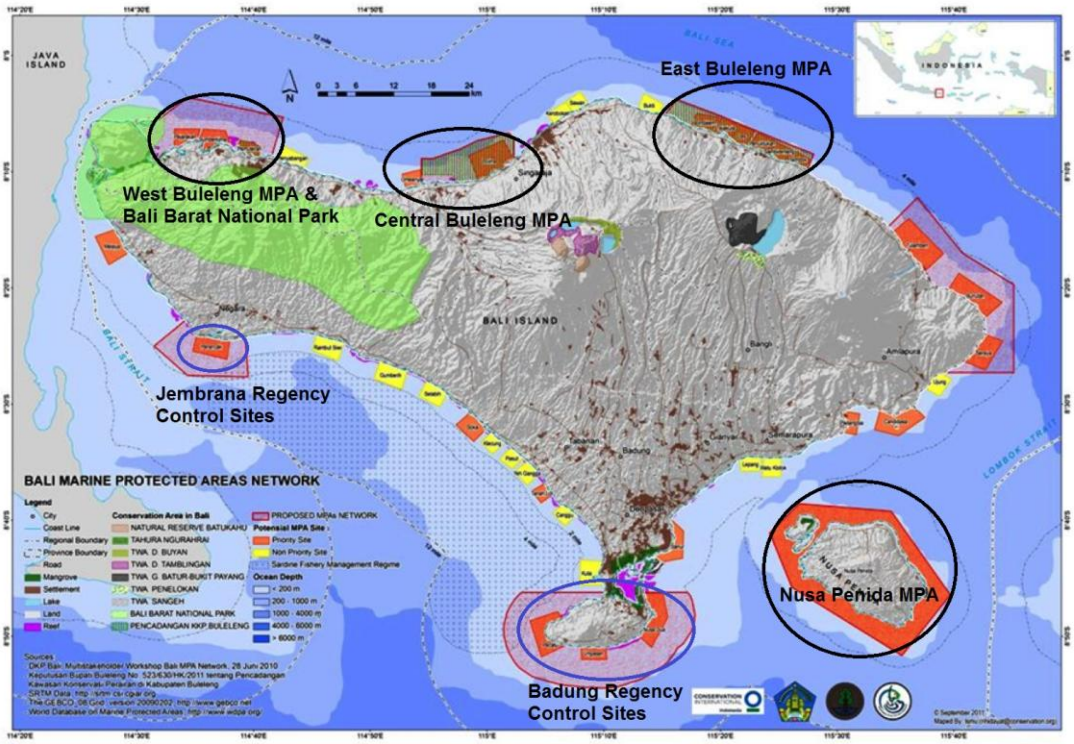

Figure 3.1: Map of study location (map is courtesy of Conservation International Indonesia Marine Program).

3.2 DATA COLLECTION

Semi-structured questionnaires were used to collect the information. This study utilized three respondent categories: resource users, MPA project participants and village officials. Overlapping, but distinct survey forms were used for each category of respondent.

To facilitate interaction with the community members, local research assistants, familiar with the community and local languages conducted the in-person structured interviews (see similar methods used by Pollnac and Seara 2011 in the

Philippines and Dalton et al. 2012 in the Caribbean). Local research assistants were personally trained to be familiar with the questionnaires and the interview methods.

A combination of both a systematic random and a snowball sampling methods were used to recruit respondents. At first, the head of village from each village was interviewed, to capture the general information of the village. If they were not available, another senior official was interviewed as a replacement. They were also asked to identify potential respondents for the key informant interview (MPA project participants) within their villages.

The key informants are those who are considered as local leaders. They have been involved in one or more of the MPA activities and/or functioned as the leader for local fishermen groups, operators of tourism related activities, or members of local environment and culture associations, etc.

The third category of respondent is the marine resource user. This research is focused on marine resource users as the primary respondents, as they are the ones who are most likely impacted by the MPA. For the purpose of this study, resource users are those who have their main source of income and livelihood based on coastal and marine resources utilization; e.g., fishermen, seaweed farmers, aquaculturists, boat crew and operators, dive/tourist guides, etc.

Thirty to forty resource user respondents were systematically selected from each village. The interviewers walked along the coastline in each village to identify and to recruit the respondents. All people encountered doing coastal and marine related uses along the beach during the survey, were asked their willingness to

participate in the study. Interviews were only conducted with the first and the fifth persons encountered. The respondents were informed concerning the study's purpose and were asked of their availability. While most interviews were conducted on the spot, there were some interviews conducted at a different time in the same day. In this study, a very few potential respondents refused to participate, minimizing the potential for self-selection bias in the sample.

3.3 INTERVIEWS

One thousand and four face to face interviews were conducted in the study location. The questionnaires and interviews were designed to address the research questions posed in Chapter 1. The interviews were conducted in *Bahasa Indonesia* and usually lasted between 30 minutes and 1.5 hours, depending on the type of questionnaire used.

3.3.1 VILLAGE OFFICIAL AND KEY INFORMANT INTERVIEWS

The interviews with local officials were aimed to get a general profile of the community and to obtain a local permit to conduct the survey in the village. The questions for these two respondent groups were mainly focused to gather community information on: (1) community profile, (2) resource utilization activities, (3) MPA management, (4) MPA benefits, (5) community organizing and involvement, and (6) any village related problems.

3.3.2 RESOURCE USER

The resource users are the primary source of information for assessing social resilience. The survey form for this respondent group is focused on: (1) personal information, such as their individual, social and economic attributes, (2) environmental attitudes, beliefs and values, (3) MPA management and implementation processes, and (4) social resilience variables.

3.4 MEASUREMENT OF VARIABLES

Measurement of some variables was based on a direct response. For example the evaluation of age, education, etc. Some questions such as "have you heard of an MPA?" required a "yes" or "no" answer. Many questions, however, especially those evaluating attitudes, beliefs or values were measured using ordinal Likert scales. In this type of question, respondents were asked to rate how strongly they agreed with each statement using a 5-point rating scale (e.g. 1=strongly disagree, 2= disagree, 3=neutral, 4=agree, 5=strongly agree) (Likert 1932, Spector 1992).

3.4.1 INDIVIDUAL CHARACTERISTICS

In this study, individual characteristics measured were respondents' age, gender, years of formal education, and their primary occupations.

3.4.2 ENVIRONMENTAL ATTITUDES, BELIEFS AND VALUES

Respondent's environmental attitudes, beliefs and values were analyzed based on their evaluation of conservation beliefs and their subjective assessment of the

degree of relationship of themselves with nature. The conservation beliefs variables were constructed of nine statements. Each of the nine statements involves some aspect of the relationships between coastal resources and human activities (see Pollnac and Crawford 2000). The following are the statements used:

1. We have to take care of the land and the sea or it will not provide for us in the future.
2. Fishing would be better if we cleared the coral where the fish hide from us.
3. If our community works together we will be able to protect our resources.
4. Farming in the hills behind the village can have an effect on the fish.
5. If we throw our garbage on the beach, the ocean takes it away and it causes no harm.
6. We do not have to worry about the air and the sea, God will take care of it for us.
7. Unless mangroves are protected we will not have any small fish to catch.
8. There are so many fish in the ocean that no matter how many we catch, there will always be enough for our needs.
9. Human activities do not influence the number of fish in the ocean.

The statements were arranged in the interviews so as to limit interference between similar statements. It will also be noticed that agreement with some would indicate an accurate belief, while agreement with others would indicate the opposite. This was done to control for responses where the respondent either agrees or disagrees with everything. Statements were randomly arranged with respect to this type of polarity. Respondents were asked if they strongly agree, agree, disagree, strongly disagree, or neither (neutral) with respect to each statement. This resulted in a scale with a range from one to five. Polarity of the statement is accounted for in the coding process, so as a score value changes from one to five it indicates an increasingly stronger and accurate belief concerning the content of the statement (Pollnac 2013). Responses from all nine statements were dichotomized at 3. Scores above 3 were coded “1” which indicates “correct” beliefs. Scores below 3 were coded “0” which indicates “incorrect” beliefs (Pollnac 2013). All the “correct” responses from

respondent were summed to create conservation belief score. Conservation belief score value is hypothetically ranging between 0 – 9.

Respondents were also asked to describe their subjective relationship with nature. Seven diagrams illustrating the human-nature relationship were used (adapted from Davis, Green & Reed 2009) (Fig. 3.2). The respondents were asked to choose a diagram that best describes their perceived relationship with nature (Davis et al. 2011). Responses were coded from one to seven, respectively. As the score changes from one to seven, it indicates a closer relationship between oneself and the nature.

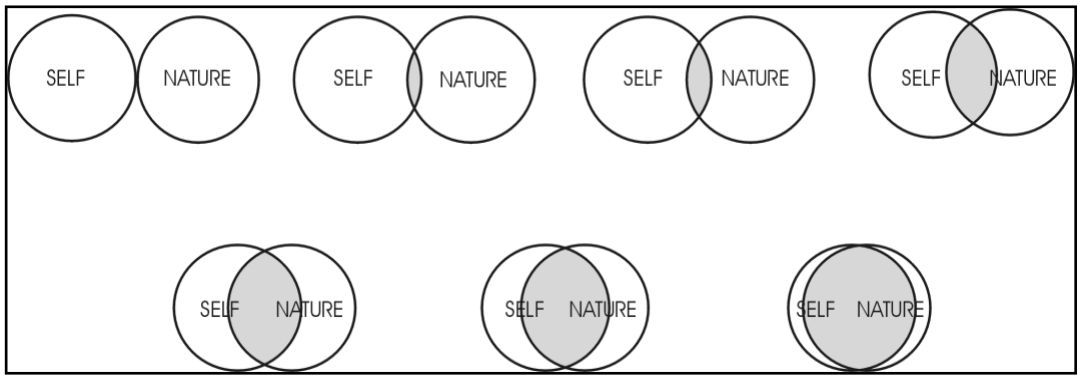

Figure 3.2: Human-Nature relationship illustrations (Adapted from Davis et al. 2009).

3.4.3 MARINE PROTECTED AREA (MPA) MEASURES

Five MPA associated measures are used: MPA awareness and participation, perception of MPA economic outcome, MPA ecological outcome, MPA process quality and MPA management and implementation level. These variables were only evaluated in sites where MPAs were present.

3.4.3.1 MPA awareness and participation

MPA awareness variable was measured using yes/no questions evaluating knowledge of MPA existence as well as the existence of fishing restriction in their community. Respondents who aware of MPA were coded “1”, who do not aware were coded “0”. MPA participation variable was evaluated based on participation of respondent in MPA monitoring or Patrol. Respondents who participate in MPA were coded “1”, who do not participate were coded “0”.

3.4.3.2 MPA Economic outcome

The economic outcome variable was constructed from the perceived MPA benefits to community and whether or not there was equal opportunity to receive such benefits. Respondents who perceived MPA benefits community were coded “1” and respondent who do not were coded “0”. Moreover, respondents who perceived the benefits are equally distributed were coded “1” and respondents who perceived the opposite were coded “0”. Only respondents who had knowledge of MPAs were asked this question.

3.4.3.3 Ecological outcome

Ecological outcome parameters were constructed from the combination of perceptions of improvement of fish abundance, coral reef condition and mangrove condition in the last five years. If respondents mentioned that there was improvement in any or all of the variables they were coded “1”, and “0” if no improvements in any were mentioned.

3.4.3.4 Process quality

To measure the process quality, respondents were asked whether or not they were consulted during the planning process and whether or not the plan reflected their views. Respondents who answered "yes" were coded as "1" and "no" were coded as "0". Only respondents who had knowledge of MPAs were asked this question.

3.4.3.5 MPA Management and implementation level

For these variables, respondents were asked if there was any clear leader for the MPA, whether or not the MPA boundaries are clear, and whether or not more MPAs should be established. Respondents who answered "yes" were coded as "1" and "no" were coded as "0". Respondents were also asked their perception of MPA management committee effectiveness on a scale of from 1 to 5 where 1 = very weak and 5 = very strong. Respondents' responding above 3 were coded "1" and coded "0" for responses 3 and below. Only respondents who had knowledge of MPAs were asked this question.

3.4.4 SOCIAL RESILIENCE

The operationalization of social resilience, used in this study as the dependent variable, was developed by Marshall and Marshall (2007) and Marshal et al. (2010). The key components of social resilience measured here are the individual's subjective beliefs and assessments about themselves rather than objective measures of a communities' abilities on these dimensions. Respondents were asked to self-assess their expected level of well-being in terms of their adaptability, flexibility, financial

and social characteristics, and willingness to be creative and novel in their approach to adapting to the requirements of (policy) change (Marshal and Marshal 2007).

A list of statements was used to measure the respondent's response to social resilience indicators. Respondents were asked to rate their attitude to each of sixteen statements (see Table 3.3) using a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. This resulted in a scale with a range from one to five. Polarity of the statement is accounted for in the coding process, so score value changes from one to five it indicates an increasingly stronger and accurate belief concerning the content of the statement (Pollnac 2013).

The dependent variables of social resilience measured in this study were the social resilience score and the social resilience components scores. The social resilience (SR) score was derived by summing the response scores across all sixteen questions. This resulted in a total possible score from 16 to 80.

A second measure of social resilience was derived from Principal Component Analysis (PCA). This was used to identify the underlying variables comprising the response to social resilience statements to reduce the complexity of factors to a more manageable number. Statements that are correlated with one another but are largely independent of other responses are combined into factors (Jolliffe 2005, Tabachnick and Fidell 2006). In this study, the factors in the analysis were rotated using varimax, which simplifies the factor structure by maximizing the variance of a column in the pattern matrix (Abdi 2003, Jolliffe 2005).

Table 3.3: Key characteristics used to measure individual social resilience (Adapted from Marshall et al. 2010)

Key characteristics	Questions used
1. Risk perception	I can cope with small changes in my industry
2. Coping ability	I am confident that I could get work elsewhere if I needed to
3. Interest to change	I am interested in learning new skills outside of my industry
4. Ability to plan, learn and organize	Every time there is a change, I plan a way to make it work for me
5. Attachment to occupation	I cannot imagine myself in any other job
6. Employability	I have many options available to me if I decide to no longer work at this industry
7. Family characteristic	We are more likely to cope with changes compared to other families I know
8. Attachment to place	I feel like I belong to this community/town
9. Business size and approach	I always know how much money is coming in and out of my business
10. Financial status	We always have an amount of cash available for emergencies
11. Livelihood diversity	I am having additional jobs that could produce fairly good income
12. Local environmental knowledge	I would be good at teaching younger people about the marine environment
13. Environmental awareness	There are too many fishers in the region
14. Access to technology and information	I can easily find the information related to my industry
15. Formal and informal networks	The friendships I have with people in this village mean a lot to me
16. Equity perception	The zonation of MPA helps to reduce the conflict between resource users

Various independent and dependent variables related to individual characteristics, perceived MPA processes and managements, environmental attitudes, and social resilience were used in this study. Table 3.4 provides the summary of variables used in this study.

Table 3.4: Summary of data analysis conducted between social resilience and several community characteristics in MPA.

Variable	Unit of Measure
Dependent	
Total SR score	Summation of likert score on 16 questions, with total possible score of 16 - 80
PCA components	
Adaptive capacity	Component scores based on individual variable loadings
Risk Awareness	Component scores based on individual variable loadings
Social-Economic	Component scores based on individual variable loadings
Community Attachment	Component scores based on individual variable loadings
Environmental Awareness	Component scores based on individual variable loadings
Independent	
Individual characteristics	
Age	Years
Years of Education	Years of formal education
Gender	Male - Female
Social characteristics	
MPA awareness	Yes - No
MPA participation	Yes - No
Community consultation	Yes - No
View consideration	Yes - No
Economic characteristics	
Perceived ecological improvement	Yes - No
Perceived MPA benefits	Yes - No
Perceived equal MPA benefits	Yes - No
Environmental attitudes, beliefs and values	
Conservation beliefs	Summation of total correct answer, with total possible score of 0 - 9
Human-nature relationship	Responses of likert scale diagram, with possible score of 1 - 7
MPA management and implementation	
Clear MPA leadership	Yes - No
Clear MPA boundary	Yes - No
MPA management committee	Strong - Weak
More MPA established	Yes - No

CHAPTER 4

RESULTS

4.1 GENERAL SAMPLE INFORMATION

In total, 1004 individuals participated in this study: 934 resource users, 40 local key informants and 30 village officials from the study sites. For the purpose of this study, the study sites are categorized into two categories, which are MPA sites and non-MPA sites. Specifically for resource users, there are 721 respondents in the MPA sites and 213 respondents are in the non-MPA sites. Table 4.1 presents the distribution of respondents.

4.2 INDIVIDUAL CHARACTERISTICS

Figure 4.1 provides the age distribution from the key respondents (resource users) that participated in the study. The respondents' ages ranged from 18 – 75 years with a mean of age of 40.2 years. The majority of respondents (52%) were in the age range of 31 – 45 years old, and only 4% were in the age range between 61 – 75 years. Most of the respondents are male (79%). The high number of male respondents was due to the fact that the survey took place along the beach where more males tend to congregate.

During the interview session, respondents were also asked to identify their primary occupation. Most of the respondents are fisherman (63%), followed by seaweed farmers 15%. While the rest of the respondents' occupations are within

tourism related jobs, such as dive guide (6%), boat related jobs (5%, such as boat captain or boat crew), fish sellers (5%) and other marine related occupations (4%). There were also respondents who reported two main occupations (2%). Three respondents did not disclose their main occupations (Figure 4.2).

Table 4.1: Number of respondents interviewed from each village.

Regency	MPA/Non MPA	Village	Resource Users Interviewed
Klungkung	Nusa Penida MPA	Toya Pakeh	24
		Ped	45
		Batu Nunggul	31
		Kutampi Kaler	30
		Nusa Lembongan	35
		Jungut Batu	33
		Suana	30
Buleleng	East Buleleng MPA	Tembok	31
		Penuktukan	30
		Les	31
		Tejakula	30
		Bon Dalem	31
		Pacung	31
	Central Buleleng MPA	Anturan	30
		Kali Bukbuk	32
		Kali Asem	31
		Temukes	31
		Pengastulan	31
		Den Carik	30
	West Buleleng MPA	Pamuteran	32
	West Bali National Park	Sumber Kima	31
		Pejarakan	31
		Sumber Kelampok	30
Negara	Non MPA	Air Kuning	31
		Perancak	30
		Pengambengan	31
Badung		Bualu	31
		Kutuh	30
		Kedonganan	30
		Jimbaran	30
Total Resource Users Interviewed			934

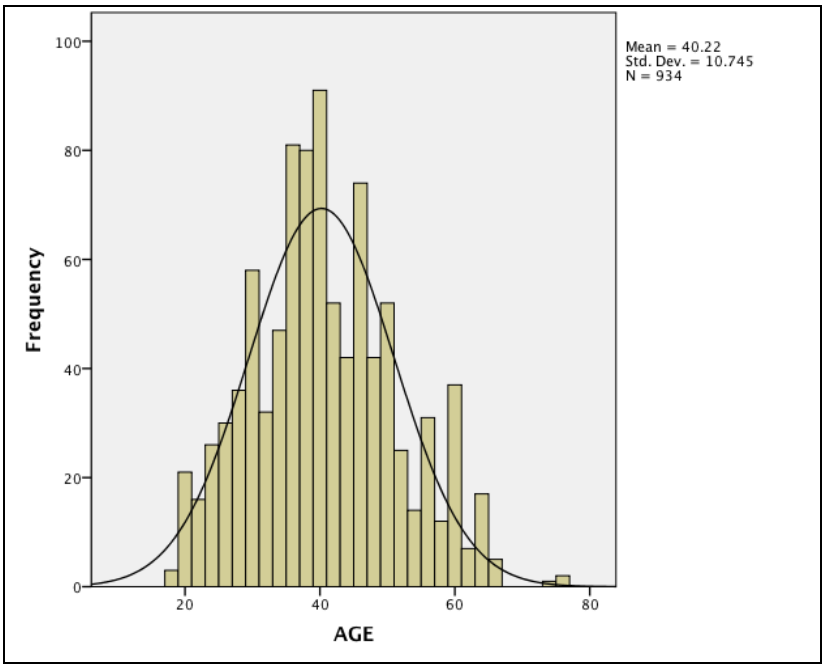

Figure 4.1: Histogram of Age distribution.

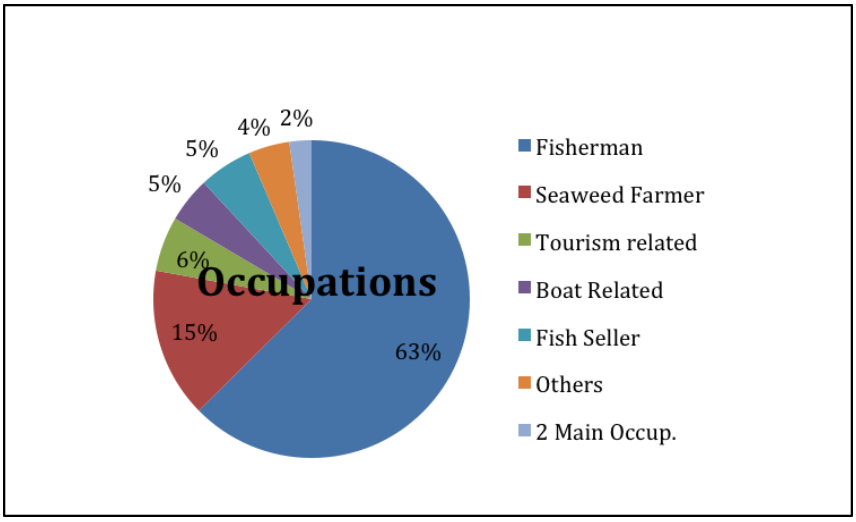

Figure 4.2: Percentage distribution of respondents' occupations.

Level of respondents' education also varied, ranging from 0 – 18 years. Figure 4.3 provides respondents' years of education distribution. The overall mean of respondents' education found in this study is 7 years (N=934; std.dev. = 3.716).

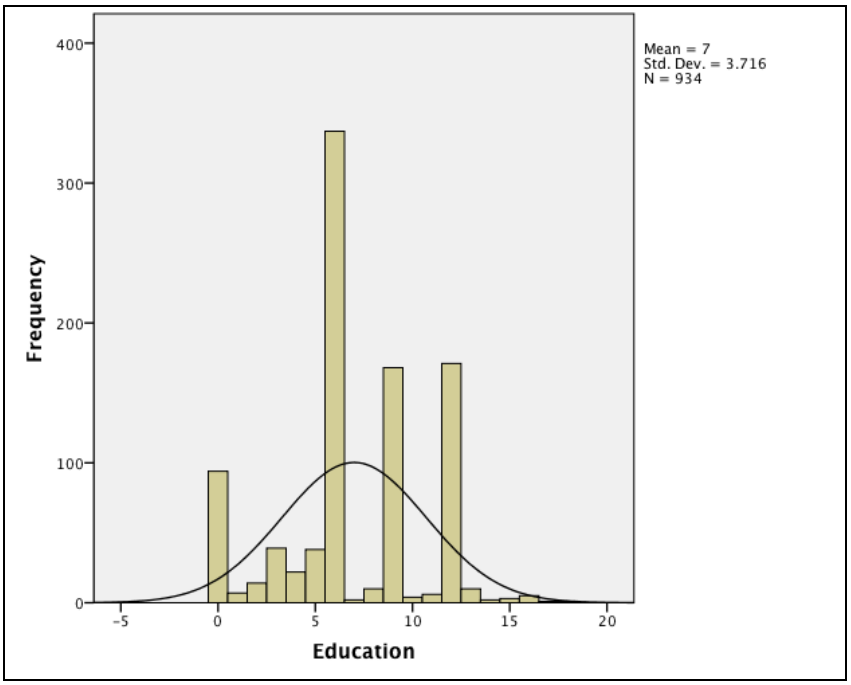

Figure 4.3: Histogram of education year's distribution.

4.3 ENVIRONMENTAL ATTITUDES, BELIEFS AND VALUES

4.3.1 RESOURCE BELIEF SCALE

As one means of obtaining information concerning community member's perceptions of the coastal resources and potential human impacts on these resources, the resource users from 30 project sites and control sites (N = 934) were requested to provide a statement concerning the degree of their agreement or disagreement with nine statements. Each of the nine statements involves some aspect of relationships

between coastal resources and human activities (see Chapter 3). Figure 4.4 provides the histogram of respondents' conservation scale.

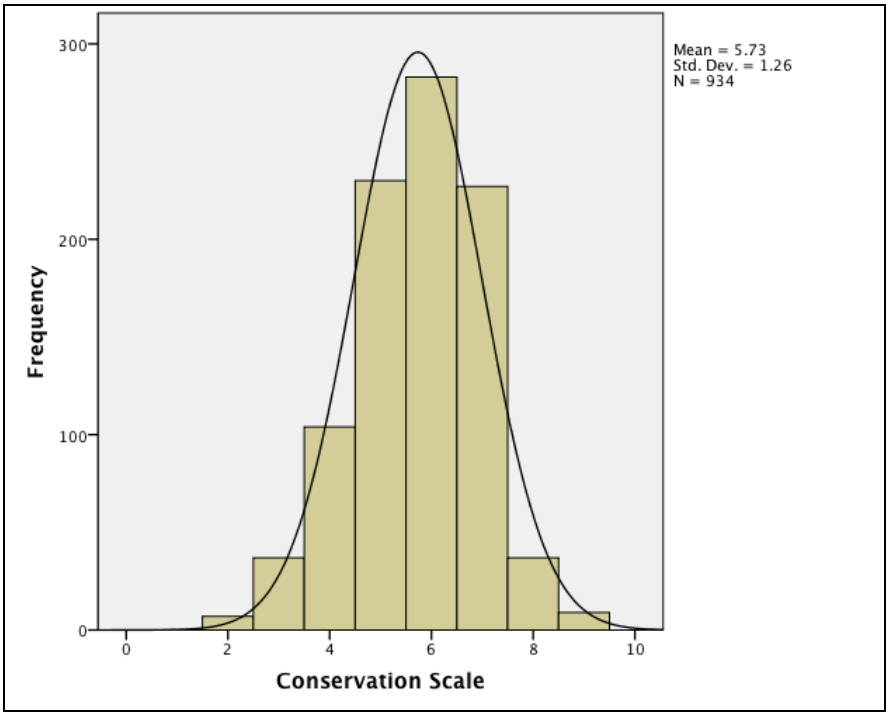

Figure 4.4: Histogram of respondents' conservation beliefs scale.

4.3.2 HUMAN-NATURE RELATIONSHIP

In regards with the human-nature relationship, the majority of the respondent (72%, N = 934) perceived a very close relationship with the environment. A descriptive statistic analysis result showed the mean response is 6.48 (in a scale 1 – 7), with standard deviation of 1.015 (N = 934).

4.4 MARINE PROTECTED AREA MEASURES

The following variables were only evaluated for respondents within MPA sites resulting in smaller number of respondents compared to respondents to the environmental attitudes, beliefs and values variables.

4.4.1 AWARENESS AND PARTICIPATION

Respondents within the MPA sites were asked if they have heard/known of the MPA or any fishing restriction. The result showed that 423 (60.26%) respondents have heard/known and only 279 (39.74%) have never heard/known the MPA/fishing restriction (N = 702). Figure 4.5 illustrates the percentage of respondents who have heard/known of the MPA or fishing restrictions.

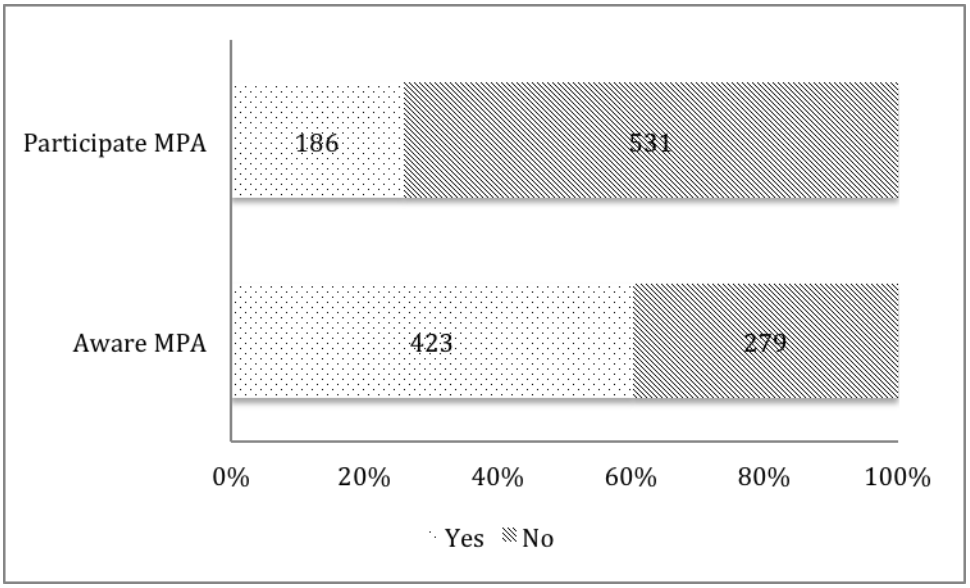

Figure 4.5: Percentage of respondents' MPA awareness and participation.

To identify participation of respondents in MPAs, they were asked about their involvement in MPA monitoring and sea watch/patrol activities. Figure 4.5 shows that

only 186 respondents (26%) mentioned that they have been involved in any of those activities (N = 717).

4.4.2 ECONOMIC OUTCOME

Respondents, who were aware of the MPA were asked whether or not MPAs have benefits for the communities. In total, 328 respondents said that MPAs have benefits in the community, for either themselves or others, and only 8 respondents said that MPAs do not benefit the community (Figure 4.6).

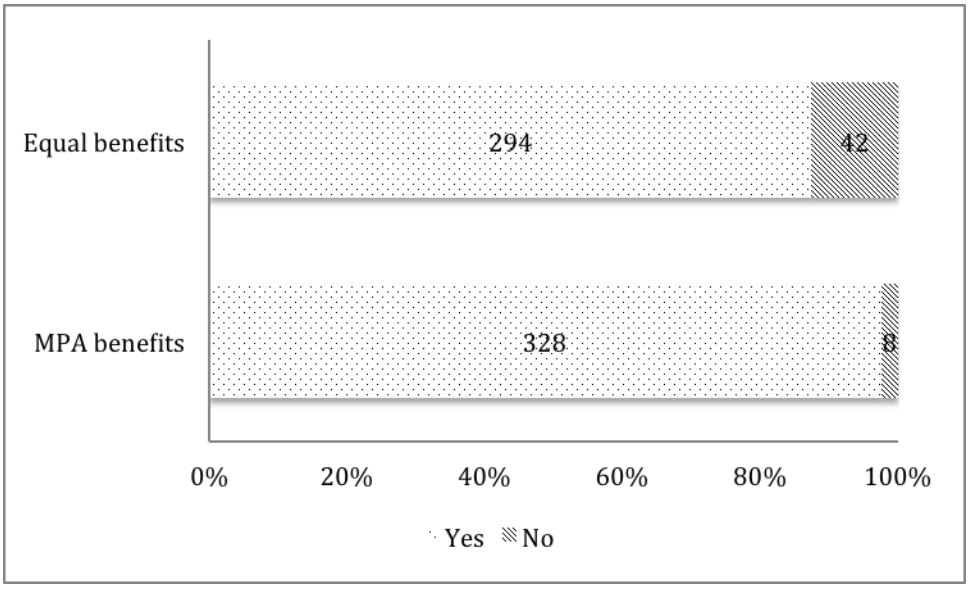

Figure 4.6: Percentage of respondents' perception of MPA benefits and equal MPA benefits.

Respondents were further asked whether or not the community members have the opportunity to receive equal benefits from the MPAs. In total, 294 (87.5%) respondents said that they have equal opportunity to receive benefits, and only 42 (12.5%) respondents said that they do not have the opportunity (Figure 4.6).

4.4.3 ECOLOGICAL OUTCOME

Respondents were asked their perception of the ecological outcome of the MPAs, which in the case of this study was the condition of fish abundance, coral reef and mangrove in the last five years. One hundred and ninety eight of the 344 respondents (58%) perceived that there is no improvement being made in terms of fish abundance. As for coral reef condition, most of the respondents (77%) perceived an improvement in its condition compared to five years ago. The majority (79%) of the 97 respondents perceived an improvement of mangrove conditions in the last five years.

4.4.4 PLANNING PROCESS QUALITY

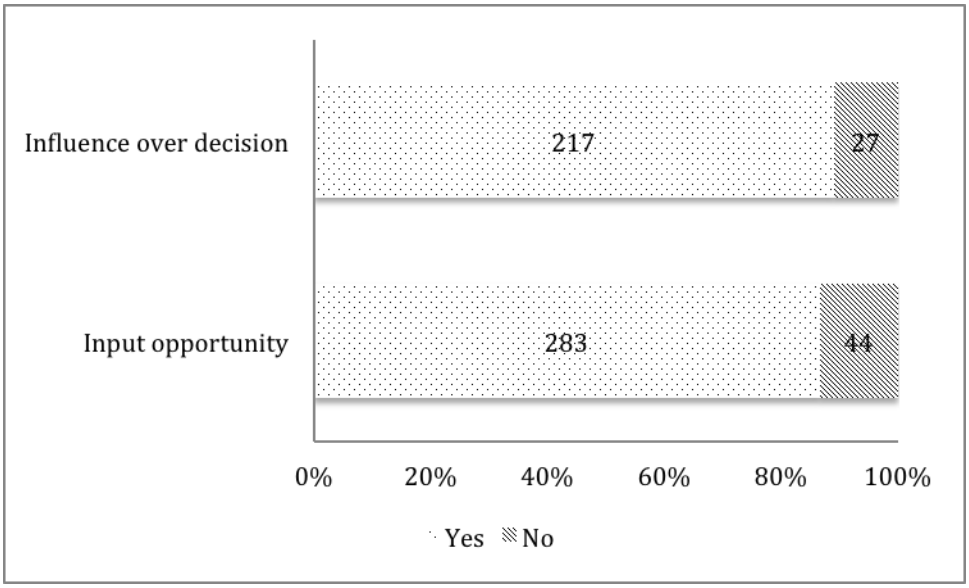

Figure 4.7: Percentage of respondents consulted in MPA planning process and perceived respondents views in the plans.

Respondents were asked whether or not they were consulted and the extent to which respondents' views were taken into consideration during the MPA planning

process. In total 283 respondents (87%) said that they were consulted during the planning process (N = 327), and 217 respondents (89%) perceived that the MPA plans reflected their views (Figure 4.7).

4.4.5 MPA MANAGEMENT AND IMPLEMENTATION LEVEL

The level of MPA implementation was evaluated on the basis of the presence of clear leadership in MPAs, clear MPAs boundaries and the perceived MPAs management level (strong/weak). Figure 4.8 shows the percentage of respondents' responses to the three indicators, clear leader, clear boundary and management level. In total, 270 (90.6%) respondents said that there is a clear leadership in the MPA (N = 298), 268 (81.21%) respondents mentioned that the MPA boundaries are clear (N = 330), 292 (87.69%) respondents agreed more MPA established (N = 333) and 192 (55%) respondents perceived that the MPA management committee is strong (N = 349).

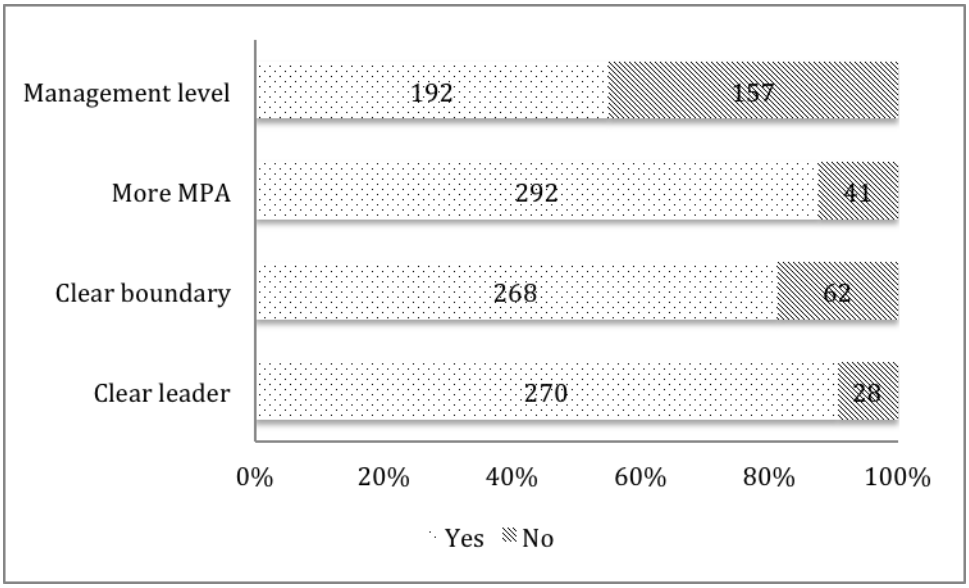

Figure 4.8: Percentage of respondents' responses in regards to MPA management level, more MPA, MPA boundary, and MPA leaders.

4.5 SOCIAL RESILIENCE

4.5.1 DEFINING AND OPERATIONALIZING SOCIAL RESILIENCE

Principal Component Analysis was used to examine resource users' responses to 16 statements (see Table 3.3) related to social resilience indicators (adapted from Marshall et al. 2010). The social resilience of resource users in Indonesia could be best explained by five major components: (1) the adaptive capacity of the individual, (2) risk awareness, (3) perceived of socio-economic status, (4) community attachment and (5) environmental awareness (Table 4.2). These components represented 48.8% of the variance.

Individual resilience of the respondents found in this study could be best described by five components. The first component contains the statements related to respondents' ability to cope, level of interest to change, ability to learn, employability and livelihood diversity. This component of social resilience represents the adaptive capacity of individual to cope with changes and the capacity of individual to improve its condition (Smit and Wandel 2006, Galoppin 2006).

The second component contains the statements related to respondents' family characteristics, risk perception, access to technology and local ecological knowledge. This component represents risk awareness of respondents. Risk is assessed based on their knowledge, available information and their family characteristics. This component seems to align with the risk perception components from the study conducted by Marshall and Marshall (2007) in the Northern Australia. They found that

risk perception is one of the important denominators of social resilience of fishermen in the Northern Australia.

Table 4.2: Principal component matrix of resource users' social resilience components.

Statements (abbreviated)	PC 1	PC 2	PC 3	PC 4	PC 5
I am confident that I could get work elsewhere if I needed to	**0.757**	0.169	-0.029	0.022	0.01
I have many options available to me if I decide to no longer work at this industry	**0.732**	0.008	0.172	-0.017	-0.079
I am interested in learning new skills outside of my industry	**0.694**	-0.216	-0.137	0.168	-0.008
I am having additional jobs that could produce fairly good income	**0.585**	-0.018	0.174	-0.178	-0.269
Every time there is a change, I plan a way to make it work for me	**0.555**	0.078	0.065	-0.013	0.103
We are more likely to cope with changes compared to other families I know	0.101	**0.663**	0.002	0.042	-0.152
I can cope with small changes in my industry	-0.1	**0.619**	0.085	0.076	-0.159
I can easily find the information related to my industry	0.078	**0.575**	0.162	0.09	0.266
I would be good at teaching younger people about the marine environment	0.025	**0.509**	0.043	-0.047	0.293
I always know how much money is coming in and out of my business	0.034	0.004	**0.758**	0.009	0.139
We always have an amount of cash available for emergencies	0.228	0.195	**0.602**	-0.199	-0.161
The zonation of MPA helps to reduce the conflict between resource users	-0.021	0.097	**0.545**	0.254	0.022
The friendships I have with people in this village mean a lot to me	0.036	0.068	0.061	**0.800**	0.167
I feel like I belong to this community/town	-0.026	0.08	0.028	**0.660**	-0.35
There are too many fishers in the region	0.038	0.113	-0.022	-0.099	**0.746**
Percent of total variance	14.93	9.93	8.57	7.98	7.37

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
One statement that had maximum factor loading scores less than 0.5 on all components was eliminated from the analysis and for calculating individual factor sores.
PC 1: Adaptive capacity; PC 2: Risk Awareness; PC 3: Perceived socio-economic status; PC 4: Community attachment; PC 5: Environmental awareness.
Total sample (N) = 934

The third component contains business characteristics, financial status and perception of equity. This component represents the socio-economic perception of respondent. In the complex of the social and ecological system, both the ecological and social economic has the same influence in the system (Perrings 1998, Levin et al. 1998). Equity issues, resilience and stewardship could be integrated in a complex system resource management (Peluso et al. 1994, Young and McCay 1995). Forbes

(2007) suggested that equity is an important factor of resilience in a region undergoing rapid change in land use and climate change.

The fourth component contains formal and informal network and attachment to place. The component represents the community attachment of the respondents. Riger and Lavrakas (1981) identified two dimensions of community attachment, which are social ties and physical rootedness. Community attachment and social networks are determinant factors in the governance of natural resources (Cohen et al. 2012, Larson et al. 2013). In line with the finding in the natural resource governance, community attachment has also been an important variable in disaster management study (Paton 2003, Cox and Perry 2011).

The last component of social resilience is explained by respondents' environmental awareness. Marshall et al. (2011) study of resource dependent community in North East Queensland, Australia found that environmental awareness is one of the important factors that decide whether or not the resource dependent communities would like to adopt seasonal climate forecast to enhance their resilience. Environmental awareness is related to environmental knowledge (Acury 1990) and could be used to predict ecological behavior (Kaiser et al. 1999).

4.5.2 SOCIAL RESILIENCE SCORES AND COMPONENT SCORES

Social resilience (SR) scores of respondents were constructed from summing all 16 of social the resilience response values. The SR scores were ranged from 16 – 80. Figure 4.9 presents the histogram of SR scores for all respondents. Descriptive

statistic analysis found that mean SR score is 58.38, the minimum score was 43 and 77 as the maximum score (N = 934; std. dev. 5.471).

Differences between MPA and non-MPA sites with regard to the SR score were analyzed using the independent sample t-test. The analysis showed that there was a statistically significant, but very small difference (t = -3.426; df = 932; p = 0.001) in the SR scores for MPA (N = 721; M = 58.04; std. dev. 5.506) and non-MPA sites (N = 213; M = 59.49; std. dev. 5.206). The means of SR score in non-MPA sites was found to be slightly higher compared to the MPA sites.

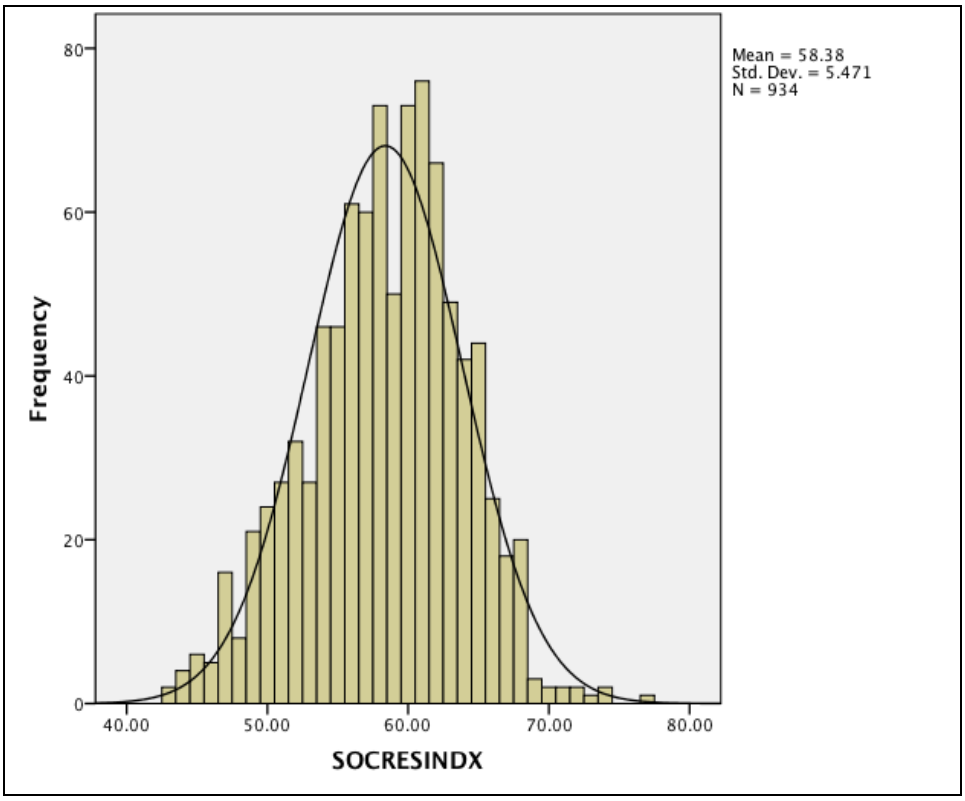

Figure 4.9: Histogram of social resilience (SR) score.

Further analysis between MPA and non-MPA sites with regard to SR components scores were conducted (see Table 4.3). Significant differences (equal variance not assumed) were found for the risk awareness ($p < 0.001$; $t = -6.846$) and environmental awareness ($p < 0.001$; $t = -8.323$) components. The means of SR components scores were higher at non-MPA sites compared to MPA sites.

Table 4.3: Difference in means of PCA components scores between MPA and non-MPA.

SR Components variable	Value	N	Mean	S.D.	t-value	d.f.	p-value
Adaptive Capacity	MPA	720	-0.016	0.993	-0.924	931	0.356
	Non-MPA	213	0.056	1.023			
Risk Awareness	MPA	720	-0.11	1.009	-6.846	396.014	0.001*
	Non-MPA	213	0.373	0.87			
Perceived Social-Economic Status	MPA	720	0.031	1.016	1.734	931	0.083
	Non-MPA	213	-0.104	0.938			
Community Attachment	MPA	720	0.008	1.004	0.473	352.009	0.637*
	Non-MPA	213	-0.028	0.987			
Environmental Awareness	MPA	720	-0.151	0.938	-8.323	321.194	0.001*
	Non-MPA	213	0.509	1.038			

* Equal variance not assumed

4.6 SOCIAL RESILIENCE (SR) AND INDIVIDUAL CHARACTERISTICS

Individual characteristics were constructed from personal attributes such as age, education and gender. In order to analyze the relationship between the SR score and individual attributes of age and years of education simple linear regression analyses were used. There is a statistically significant but very weak negative relationship between age and SR scores ($R = - 0.074$; $r^2 = 0.005$) $F = 5.82$; $p = 0.024$). Analysis of respondents' years of education and SR score indicated a somewhat stronger, statistically significant relationship between these two parameters ($R = 0.206$, $r^2 = 0.042$, $F = 41.239$; $p = 0.001$).

Further analysis between SR components and age revealed that a statistically significant, but weak negative relationship was found with the adaptive capacity component ($R = -0.139$; $r^2 = 0.019$; $F = 18.472$; $p = 0.001$), while the analysis between education and SR components found significant relationships with two components, which were the adaptive capacity ($R = 0.28$; $r^2 = 0.078$; $F = 79.068$; $p = 0.001$) and environmental awareness components ($R = -0.073$; $r^2 = 0.005$; $F = 4.963$; $p = 0.026$).

An independent sample t-test was conducted to see whether or not the means of SR scores differed between genders. The analysis found that there was a significant difference in SR score ($p < 0.001$; $t = 5.890$; d.f. = 931) between male ($N = 813$; $M = 58.77$) and female ($N = 120$; $M = 55.68$) respondents, where males had a slightly higher score. A further analysis between gender and SR components scores, found statistically significant differences in means with regard to the adaptive capacity ($p = 0.001$; $t = 3.388$) and risk awareness components ($p = 0.002$; $t = 3.156$) between male ($N = 812$) and female ($N = 120$). Males scored higher than female on both components.

4.7 SOCIAL RESILIENCE (SR) AND SOCIAL CHARACTERISTICS

The relationship between the Social Resilience score and selected independent variables is examined in Table 4.4. Responses related to MPA were analyzed. A statistically significant, but small difference was found between respondents who were aware and those not aware of the MPA in terms of their SR score ($p < 0.001$; $t = -3.975$).

Table 4.4: Difference in mean scores of SR and social characteristics analysis.

Variable	Value	N	Mean	S.D.	t-value	d.f.	p-value
Aware MPA	Yes	423	58.801	5.489	-3.975	700	< 0.001
	No	279	57.139	5.414			
Participate MPA	Yes	186	60.396	5.216	-6.99	715	< 0.001
	No	531	57.215	5.377			
Community Consulted	Yes	283	59.63	5.205	-1.666	325	> 0.05
	No	44	58.23	4.997			
View Considered	Yes	217	59.92	5.758	-1.676	242	> 0.05
	No	27	58.19	4.989			

The difference between respondents who participated and those who did not participate in MPA planning and management processes was also found to be statistically significant ($p < 0.001$; $t = -6.99$). However, there is no relationship between respondents who said that community members were consulted and not consulted during the process in terms of their SR score ($p = >0.05$; $t = -1.666$). A similar result was found between respondents' who perceived their view were considered and not considered ($p >0.05$; $t = -1.676$).

Independent sample t-tests between each of the social characteristic parameters and SR components were employed to evaluate differences between means of component scores and the social parameters. Table 4.5 presents results of analysis between the SR components and social characteristics (only statistically significant results presented). With regard to MPA awareness parameters, statistically significant differences were found with the adaptive capacity component ($p = 0.02$; $t = -2.333$), risk awareness component ($p = 0.004$; $t = -2.867$), and perceived social-economic status component ($p = 0.002$; $t = -3.087$). A similar result was found for the MPA participation parameter. Statistically significant differences were found with adaptive capacity ($p = 0.004$; $t = -2.919$), risk awareness ($p = 0.001$; $t = -6.751$), and perceived

social-economic status components (p = 0.001; t = -5.28). Respondents who aware and participate in MPA scored higher compared to respondents who are not aware and do not participate. Statistically significant differences were also found with perceived social-economic (p = 0.021; t = -2.321) and environmental awareness components (components) in relation to the community consultation parameters. Respondents who stated that the communities were consulted during MPA planning and management processes scored higher as compare to respondents who stated that the communities were not consulted. Interestingly, the analysis found the opposite result for the environmental awareness components.

Table 4.5: Difference in mean scores of SR components and social characteristics analysis.

Variables	SR Components	Value	N	Mean	Std.Dev.	Std. Error	t-value	d.f.	p-value
Aware MPA	Adaptive Capacity	Yes	422	0.06	0.988	0.048	-2.333	699	0.02
		No	279	-0.177	0.987	0.059			
	Risk Awareness	Yes	422	-0.011	0.996	0.048	-2.867	699	0.004
		No	279	-0.232	1.001	0.059			
	Perceived Social-Economic	Yes	422	0.137	1.005	0.049	-3.087	699	0.002
		No	279	-0.103	1.009	0.06			
Participate MPA	Adaptive Capacity	Yes	186	0.167	0.979	0.072	-2.919	714	0.004
		No	530	-0.078	0.99	0.043			
	Risk Awareness	Yes	186	0.304	0.936	0.069	-6.751	714	0.001
		No	530	-0.26	0.997	0.043			
	Perceived Social-Economic	Yes	186	0.359	1.017	0.075	-5.28	714	0.001
		No	530	-0.089	0.992	0.043			
Community Consulted	Perceived Social-Economic	Yes	283	0.229	0.941	0.056	-2.321	325	0.021
		No	44	-0.127	0.989	0.149			
	Environmental Awareness	Yes	283	-0.177	0.864	0.051	2.327	325	0.021
		No	44	0.142	0.714	0.108			
View Considered	Adaptive Capacity	Yes	217	0.226	0.889	0.06	-3.294	242	0.001
		No	27	-0.399	1.218	0.234			
	Environmental Awareness	Yes	217	-0.124	0.858	0.058	-2.081	242	0.039
		No	27	-0.495	0.991	0.191			

The last parameter of social characteristics is respondent's perception of whether or not their views were considered. Analysis revealed that statistically significant differences were found with regard to the adaptive capacity ($p = 0.001$; -3.294), and environmental awareness components ($p = 0.039$; $t = -2.081$). Respondents who feel that their views were considered during the MPA processes scored higher as compare to respondents who feel that their views were not considered in both the adaptive capacity and environmental awareness components.

4.8 SOCIAL RESILIENCE (SR) AND ECONOMIC CHARACTERISTICS

Economic characteristics in this study are derived from economic and resource status indicators, two different, yet interrelated indicators. Table 4.6 examines the relationships between the SR score and the economic characteristics. The economic indicators consist of two variables of perceived MPA benefits and equal MPA benefits. An independent sample t-test was conducted to investigate the difference in means of SR score between respondents who perceived there were economic related benefits and who were not.

Table 4.6: Difference in mean scores of SR and economic characteristics analysis.

Variable	Value	N	Mean	S.D.	t-value	d.f.	p-value
Perceived Ecological Outcome	Yes	293	59.59	5.147	-2.507	342	< 0.05
	No	51	57.59	5.95			
Perceived MPA benefits	Yes	328	59.43	5.357	-0.161	334	> 0.05
	No	8	59.13	5.293			
Equal MPA benefits	Yes	294	59.48	5.226	-1.442	334	> 0.05
	No	42	58.21	5.953			

Respondents' perception of ecological status represents resource indicators. Ecological outcome parameters were constructed from the combination of perceptions

of improvement of fish abundance, coral reef condition and mangrove condition in the last five years. An independent sample t-test was conducted to investigate the difference in means of SR scores between respondents who perceived there were improvements and who were not.

In total 85% respondents perceived that the MPA has helped to improve the ecological condition, and only 15% of respondents perceived the opposite. An independent sample t-test between the two responses in related to their SR score revealed a statistically significant difference between these respondents: those who perceived positive ecological outcomes have a higher SR score than those who do not ($p = 0.013$; $t = -2.507$). 98% of the respondents perceived that the MPA has benefits to community and 88% respondents perceived that the benefits were equally distributed in the community. The independent sample t-test result found no statistically significant difference between the respondents who perceived that the MPA has benefits and those who did not with regard to their SR score ($p = 0.871$; $t = -0.161$). A similar result was also found in respondents' responses concerning equal MPA benefits in terms of their SR score ($p = 0.150$; $t = -1.442$).

A further independent sample t-test analysis of the economic characteristics and the SR components conducted to investigate the whether or not the difference in means existed. Table 4.7 presents the results found between SR components and the economic characteristics (only statistically significant results presented). The analysis indicated a statistically significant difference between the perceived ecological outcome and the risk awareness components ($p = 0.002$; $t = -3.153$). The mean component score of respondents who perceived ecological improvements is higher as

compared to respondents who perceived no improvements being made. A statistically significant, but weak difference was also found between the equal MPA benefits parameter and the risk awareness component ($p = 0.03$; $t = -2.184$). Respondents who perceived that the MPA benefits are equally distributed scored higher as compare to respondents who perceived that the benefits were not equally distributed in the community.

Table 4.7: Difference in mean scores of SR components and economic characteristics analysis.

Variable	Components	Value	N	Mean	Std. Dev.	Std. Error	t-value	d.f.	p-value
Ecological Outcome	Risk Awareness	Yes	293	0.124	0.995	0.058	-3.153	342	0.002
		No	51	-0.351	0.979	0.137			
Equal benefits of MPA	Risk Awareness	Yes	294	0.098	0.995	0.058	-2.184	334	0.03
		No	42	-0.263	1.059	0.164			

4.9 SOCIAL RESILIENCE (SR) AND ENVIRONMENTAL ATTITUDES, BELIEFS AND VALUES

Linear regression analysis is used to examine the relationship between environmental attitudes/values and the SR score. The analysis showed that there is a statistically significant, weak relationship between the conservation score and SR score ($R = 0.114$; $r^2 = 0.013$, $F = 12.290$; $p = 0.001$). Further analysis between perceived self-nature relationship and the SC score indicated no significant relationship ($R = 0.033$; $r^2 = 0.001$, $F = 1.012$; $p = 0.315$).

The analysis of the conservation score with the SR components found a statistical significant, but weak relationship with the risk awareness component ($R =$

0.071; r^2 = 0.005; F = 4.663; p = 0.031) and perceived social-economic status component (R = 0.169; r^2 = 0.029; F = 27.432; p = 0.001). Weak but statistically significant relationships were found with the risk awareness component (R = 0.128; r^2 = 0.016; F = 15.399; p = 0.001) and environmental awareness component (R = 0.1; r^2 = 0.01; F = 9.424; p = 0.002) with regard to respondents' self-nature relationship perception.

4.10 SOCIAL RESILIENCE (SR) AND MPA MANAGEMENT AND IMPLEMENTATION

Prospective policy in this study was examined in terms of the Management of MPAs. The MPA management parameter consisted of perception of clear leadership and clearly marked boundaries of the MPA, perceived strength of the MPA management committee and whether or not there should be more MPAs established. An independent sample t-test was used to investigate the relationship between the SR score and respondents' perceptions of the MPA management indicators (Table 4.8).

Table 4.8: Difference in mean scores of SR and MPA management and implementation analysis.

Variable	Value	N	Mean	S.D.	t-value	d.f.	p-value
Clear Leadership	Yes	270	59.49	5.142	-2.311	296	< 0.05
	No	28	57.11	5.587			
Clear Boundary	Yes	268	59.52	5.145	-0.914	328	> 0.05
	No	62	58.84	5.82			
MPA Management Committee	Strong	192	59.7	5.308	-1.832	347	> 0.05
	Weak	157	58.66	5.317			
More MPA Established	Yes	292	59.33	5.471	-1.222	331	> 0.05
	No	41	58.24	4.091			

A total of 268 (90%) of the respondents within the MPA sites perceived that the MPAs have clear leader, and only 28 (10%) of respondents perceived the opposite.

An independent sample t-test analysis found a statistically significant, but weak difference between respondents perception in relation to their SR score ($p = 0.022$; $t = -2.311$). There are no statistically significant relationships between the other MPA variables And the SR score.

Further independent sample t-tests were conducted between the MPA management and implementation parameters and the SR components. Table 4.9 presents the analysis between SR components and MPA management/implementation characteristics (only statistically significant result presented). A statistically significant, but weak difference was found between clear leadership and the perceived social-economical status component ($p = 0.041$; $t = -2.055$). Respondents who perceived a clear leadership in MPA scored higher as compared to respondents who perceived the opposite in the social-economic component of social resilience. Analysis between the clear boundary parameter and the SR components found relatively small differences but statistically significant with regard to the risk perception component ($p = 0.016$; $t = -2.411$), community attachment component ($p = 0.025$; $t = -2.247$), and environmental awareness component with $p = 0.014$ and $t = 2.487$ (equal variance not assumed).

Higher scores were found for both the risk perception and community attachment components for respondents who perceived clear MPA boundary as compare to respondents who perceived the boundary was not clear. It is the opposite for the environmental awareness components, respondents who perceived clear boundary scored lower as compare to respondents who perceived an unclear boundary. In regards to MPA management committee parameter, statistically significant, but

weak differences were found with regard to the risk component (P = 0.001; t = -3.604) and perceived social-economic status component (p = 0.032; t = -2.152). Respondents who perceived a strong MPA committee scored higher in both risk awareness and social-economic components as compare to respondents who perceived a weak committee. No significant differences were found with any of the components of social resilience with regard to establishment of more MPAs.

Table 4.9: Difference in mean scores of SR components and MPA management and implementation characteristics analysis.

Variable	Components	Value	N	Mean	Std. Dev.	Std. Error	t-value	d.f.	p-value
Clear Leadership	Social-Economic	Yes	270	0.283	0.975	0.059	-2.055	296	0.041
		No	28	-0.112	0.898	0.169			
Clear Boundary	Risk Awareness	Yes	268	0.123	0.998	0.061	-2.411	328	0.016
		No	62	-0.219	1.043	0.132			
	Community Attachment	Yes	268	0.077	0.989	0.06	-2.247	328	0.025
		No	62	-0.231	0.901	0.114			
	Environmental Awareness	Yes	268	-0.172	0.884	0.054	2.487	106.39	0.014*
		No	62	0.095	0.732	0.093			
MPA Management Committee	Risk Awareness	Strong	192	0.216	0.982	0.071	-3.604	347	0.001
		Weak	157	-0.169	1.005	0.08			
	Social-Economic	Strong	192	0.301	0.964	0.069	-2.152	347	0.032
		Weak	157	0.077	0.97	0.077			

* Equal variance not assumed

CHAPTER 5

DISCUSSION

This chapter provides an overview of the study results. I discuss the results presented in the previous chapter to address research questions posed in chapter 1 within the context of the current literature. This chapter concludes with the discussion of the study limitations and recommendations for future research.

5.1 DEGREE OF VARIABILITY IN INDIVIDUAL RESILIENCE

The social resilience of resource users in Indonesia could be best explained by five major components: (1) the adaptive capacity of the individual, (2) risk awareness, (3) perceived of socio-economic status, (4) community attachment and (5) environmental awareness.

This study also found that the social resilience (SR) scores of people who lived within MPA and non-MPA areas are statistically significantly different. The mean score of SR is slightly higher for respondents in the non-MPA area as compared to respondents living within the MPA area. Detailed analysis of SR components between MPA and non-MPA sites found statistically significant differences in the risk awareness and environmental awareness components, where respondents from non-MPA areas scored slightly higher than those from MPA sites.

These results indicate that MPAs have a weak negative impact on the level of resource users' social resiliency. As Abesamis et al. (2006) noted, MPAs could bring

a major change to coastal communities such as restricted resource use access, reduced fishing grounds and increased natural resource protection and conservation. Thus, it is going to be a challenge for the MPA managers concerning how to improve the resiliency of resource users within the MPA. Lebel et al. (2006) suggested that there are at least three attributes of governance that the manager should focus on to improve the resilience of a social-ecological system: (1) stakeholder participation; (2) polycentric or multilayered governing institutions and (3) accountable authority.

Cinner et al. (2012) offered several examples of policy actions to increase resilience at the local scale that could be taken by the MPA managers and the governments. In the short-term, they suggested fishery diversifications, market and information improvements, and temporary fishing restriction removal. Supplemental livelihood supports (outside of fisheries) and strengthening of local community groups are examples of policy actions offered for the medium-term. As for the long-term policy actions, they suggested investment in strong local governance institutions, poverty reduction, improvement of health status of fishing communities and phasing out of fishing.

5.2 INDIVIDUAL RESILIENCE AND SOCIAL CHARACTERISTICS

Resource dependent people are typically less flexible as they only have limited transferable skills (Marshall et al. 2007). They argued that, young resource users typically leave formal education early for securing an apprenticeship, while older resource users typically have become too attached to their job and became less flexible for any new employment opportunities within their area. As a result, they are “locked”

into their occupation (Marshall et al. 2007), which ultimately could negatively affect their resilience. Age, education level and attitude to working elsewhere are some of indicators of individuals' employability (Marshall et al. 2007).

This study found that age and education, have a significant relationship with the SR score. Interestingly, a negative correlation between age and SR score was found. This indicates that individual resiliency decreases as age increases. An analysis of the SR components also found a negative but significant relationship between age and the adaptive capacity components. Sutton and Tobing (2012) study of fishers in the Great Barrier Reef found a similar result, where age had a significant but negative correlation with the fishermen's SR. These facts suggest that age might likely be used to predict the direction (either high or low) of individual's social resilience levels.

Although the relationship is very weak, as expected, years of education have a positive relationship with the SR score. This is somewhat similar to the Adger et al. study in 2002 that found that education is a factor that enhances social resilience of coastal communities in Vietnam. People who are educated will have access to information, which in turn could result in more options for jobs. Education also contributes to the adaptive capacity and environmental awareness components of social resilience in Indonesia; Fulan (1970) argued that education is positively linked to individual adaptive capacity. In addition, a higher education level will increase employability (Graham and Paul 2010). A well-designed environmental education program could be used to increase environmental awareness, which in turn could change ones behaviors towards the environment (Hungerford & Volk 1990).

Although the roles of woman in the resource dependent communities have been acknowledged, the hierarchy of gender is still happening (Bennett 2005). In this study, gender was found to have relationship with the level of individual social resilience. Male resource users tend to have higher SR score compared to female. To improve the level of social resilience of female resource users, they have to be actively engaged in the MPA planning and management processes. A study of forest communities in India and Nepal found that the presence of females in community institutions for forest governance were significantly improved the forest condition (Agarwal 2009).

Social characteristics have been related to the level of either individual or community social resilience (Adger et al. 2002, Marshall 2007, Sutton and Tobing 2012). Social characteristics such as awareness and participation in MPA activities, which were statistically significantly related to resilience, could help to enhance their ability to cope and adapt to any sudden change brought by the MPA. The analysis of relationships between SR components and the social characteristic parameters indicates that two of the most important components of social resilience--adaptive capacity and risk awareness—are related to these social variables. In order to increase the resiliency, the MPA managers should have to understand the social characteristics of both the individuals and communities. Programs to compensate for the short-term impacts of MPA establishment should be designed in line with the needs and characteristics of the involved community to avoid the failure of program implementation.

In order for the MPA program to be successful, the community has to be actively involved from the earliest stages of MPA planning and management processes. Mascia (2004) offered four critical sociopolitical principles in designing MPAs: (1) clear decision making arrangements, (2) clear rule of resource utilization, (3) clear monitoring and enforcement system and (4) clear conflict resolution mechanism. These principles could be used to ensure the support of stakeholders, including resource users to MPAs which could, hopefully, increase their resilience.

5.3 INDIVIDUAL RESILIENCE AND ECONOMIC CHARACTERISTICS

As mentioned in the earlier chapter, the economic characteristics used here are related to the resource indicators (ecological status) and perceived benefits of the MPA. The analysis of economic characteristics and SR components showed that the economic characteristics in this study are related to the risk awareness component of social resilience.

The study also found that the current ecological status of the marine resource has a statistically significant positive relationship with the SR score, while the perceived benefit of MPA and whether or not the MPA benefit was equal were not related to the score. This result explains the interrelationship between the social and ecological factors in a complex social-ecological system, such as MPAs (Lebel et al 2006, Pollnac et al. 2010). Maintaining the ecological performance of MPAs in the long-term could positively contribute to resiliency, as healthy marine resources could potentially diversify the source of income for resource users.

5.4 INDIVIDUAL RESILIENCE AND ENVIRONMENTAL ATTITUDES AND BELIEFS

Environmental attitudes of an individual heavily influence their ecological behavior (Kaiser et al. 1999). In this study, environmental attitudes and beliefs characteristics are related to the risk awareness, perceived social-economic status and environmental awareness components of respondents' social resilience. The analysis indicated that environmental knowledge and values of the individual have a weak, positive relationship with the overall social resilience score. To improve community environmental attitudes and knowledge, MPA managers should have strategy that aims to create and to improve awareness and knowledge of the local environment. Utilizing important flagship or charismatic species to create sense of pride and ownership by the community could be one of the options.

5.5 INDIVIDUAL RESILIENCE AND MPA MANAGEMENT AND IMPLEMENTATION

MPA implementation processes potentially have some impact on resource users' social resilience. This study found that several aspects related to MPA management processes could potentially improve their resilience. The respondents' perception of MPA management and implementation processes were related to the perceived social-economic and risk awareness component of social resilience. The existence of clear leadership, clear MPA boundary, and a strong MPA management committee could potentially help in bridging the possible negative short-term impacts of an MPA. The results have shown that social resilience level of resource users is not related with the respondents perceived knowledge of MPA related management,

impact and activity. Only perceptions of clear leadership influenced CR scores. Since most of the MPAs in this study are relatively new, MPA managers could re-design their programs and include a strategy to improve the resiliency of resource users.

To manage a complex social-ecological interaction system such as a protected area, an effective governance mechanism is needed. Adaptive co-management has been used and proven to be useful in many contexts and situations (Wollenberg et al. 2000, Olsson et al. 2004a,b). Armitage et al. (2008:95) presented four important aspect of co-management: "…innovative institutional arrangements and incentives across spatiotemporal scales and levels, learning through complexity and change, monitoring and assessment of interventions, the role of power, and opportunity to link science and policy".

5.6 STUDY LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH.

The author acknowledges a numbers of limitations in this study. To build an operational definition and concepts of social resilience, an in depth interview with resource users is necessary to get descriptive information concerning social/individual resilience components to compliment the quantitative responses. Limited sets of questions were used to explain the potential social resilience indicators, which might not be best to capture the essence of such indicators in defining social resilience.

Despite some of its limitations, this study has shown that some personal and social attributes associated with an MPA could potentially have an impact on the level of individual resource users' social resilience. However, a more detailed study of

demographics and socio-economic indicators to compliment the information found in this study is needed. Strategies that the resource dependent communities employed in order to cope with the changes brought by the establishment of MPA also need to be further investigated. Finally, building baseline information of people's perceptions of social resilience indicators could help to assess the potential impacts of MPAs on resource dependent people.

CHAPTER 6

CONCLUSION

This study explores the social resiliency of resource dependent communities in Indonesia. It seeks to understand the relationship of social resilience level with selected components of social, economic, environmental and MPA governance. I aimed to provide information on the potential impact of MPAs on the social resiliency of individuals within their communities. I hope the information found in this study can be a basis for future research in the social dimensions of MPAs. Additionally, I expect that the findings in this study could be used as a basis for MPA managers in Indonesia to include the resilience concept and its contributing factors in designing their plans for MPAs.

This study has discovered some important aspects of social resiliency and its relation to some aspects of MPAs. The social resilience of resource dependent people in Indonesia could be best explained in five components, which are: adaptive capacity, risk awareness, perceived social-economic status, community attachment and environmental awareness. In order to fine-tune the finding, these components of social resilience should be tested in future studies in various locations and settings. A summary of statistically significant findings between SR score and SR components score can be found in Table 6.1.

Table 6.1: Statistically significant result from variables analyzed

Variables	Values	SR Score	SR Components				
			AC	RA	SE	CA	EA
MPA	Yes – No	**P < 0.001**	P > 0.05	**P < 0.001***	P > 0.05	P > 0.05	**P < 0.001***
Age	18 – 75	**P < 0.05**	**P < 0.001**	P > 0.05	P > 0.05	P > 0.05	P > 0.05
Years of Education	0 – 18	**P < 0.001**	**P < 0.001**	P > 0.05	P > 0.05	P > 0.05	**P < 0.05**
Gender	Male – Female	**P < 0.001**	**P < 0.001**	**P < 0.001**	P > 0.05	P > 0.05	P > 0.05
MPA Awareness	Yes – No	**P < 0.001**	**P < 0.05**	**P < 0.05**	**P < 0.05**	P > 0.05	P > 0.05
MPA Participation	Yes – No	**P < 0.001**	**P < 0.05**	**P < 0.001**	**P < 0.001**	P > 0.05	P > 0.05
Community Consultation	Yes – No	P > 0.05	P > 0.05	P > 0.05	**P < 0.05**	P > 0.05	**P < 0.05**
View Consideration	Yes – No	P > 0.05	**P < 0.001**	P > 0.05	P > 0.05	P > 0.05	**P < 0.05**
Perceived Ecol. Status	Yes – No	**P < 0.05**	P > 0.05	**P < 0.05**	P > 0.05	P > 0.05	P > 0.05
Perceived MPA Benefits	Yes – No	P > 0.05	P > 0.05	P > 0.05	P > 0.05	P > 0.05	P > 0.05
Perceived MPA Benefits Equal	Yes – No	P > 0.05	P > 0.05	**P < 0.05**	P > 0.05	P > 0.05	P > 0.05
Conservation Score	0 – 9	**P < 0.001**	P > 0.05	**P < 0.05**	**P < 0.001**	P > 0.05	P > 0.05
Human-Nature Relationship	1 – 7	P > 0.05	P > 0.05	**P < 0.001**	P > 0.05	P > 0.05	**P < 0.05**
Clear MPA leader	Yes – No	**P < 0.05**	P > 0.05	P > 0.05	**P < 0.05**	P > 0.05	P > 0.05
Clear MPA Boundary	Yes – No	P > 0.05	P > 0.05	**P < 0.05**	P > 0.05	**P < 0.05**	**P < 0.05***
MPA Committee	Strong – Weak	P > 0.05	P > 0.05	**P < 0.001**	**P < 0.05**	P > 0.05	P > 0.05
More MPA Established	Yes – No	P > 0.05	P > 0.05	P > 0.05	P > 0.05	P > 0.05	P > 0.05

* Equal variance not assumed

This study has suggested that MPAs have some degree of influence on the level of individual social resilience. Although the level of social resiliency of people within the MPA area is lower than people living in a non-MPA site, only a very small difference was found. This is an indication of the potential impact of MPAs on the resource users. However, to ensure whether or not the MPA is the primary cause of the lower SR score of resource users, well-documented baseline information is needed.

Individual characteristics such as age, years of education and gender have relationships with the level of social resilience. Increasing peoples' knowledge and

participation in MPA related activities could be the first step to improve overall community resilience.

The improvement in ecological aspects of MPA has a potential impact on increasing the resiliency of resource dependent people from the economic perspective. To be fully supported by the community, the MPA should be able to show improvement in ecological conditions. Improvement in ecological conditions could provide more options to the community on how to utilize them. It could support the development of a new alternative livelihood income from tourism.

Environmental attitudes, values and beliefs of people have a relationship with their level of social resilience. People who have a high environmental attitude tend to have good environmental behavior. This type of behavior could help to reduce the pressure on the natural resources, which in turn could support the ecological/ economical goals of MPAs.

Lastly, our finding shows that how the MPA is governed and managed could have impact on resource users' social resilience level. In this study, a specific indicator of clear leadership of a MPA was found to have the potential to positively impact community resilience. Clear leadership could improve the trust of community in the management, which consequently could improve the legitimacy of the MPA in the community. Pollnac et al. 2001 and Crawford et al. 2000 found that local leadership support is one of the factors that contributes to the successful of community based MPAs in the Philippines.

APPENDICES

QUESTIONS FOR GENERAL COMMUNITY – INDIVIDUAL
PERTANYAAN UNTUK MASYARAKAT UMUM – INDIVIDUAL

IDENTIFICATION (IDENTIFIKASI**)**

Village:_____ **District:**_____ **Regency:**_____ **Province:**_____
Desa Kecamatan Kabupaten Propinsi

Interviewer name:_____ **Date:**_____
Nama pewawancara Waktu interview

INDIVIDUAL ATTRIBUTE (ATRIBUT INDIVIDUAL**)**

1. ID respondent:_____ **2. Age**:_____ **3. Gender:**_____
ID responden Usia Jenis Kelamin

4. Education Level:_____ **5. Marital status:**_____
Tingkat pendidikan Status perkawinan

6. What is the size of your household?_____
Berapa jumlah penghuni rumah anda?

7. How many is your dependent children?_____
Berapa jumlah anak tanggungan anda

8. Were you born in this village? Yes ____ No____ (Where do you come from?)_____
Apakah anda lahir disini? Ya Tidak (Darimanakah anda berasal)

9. Why did you move to this village?_____
Mengapa anda pindah ke desa ini?

10. How long have you been living in this village?_____
Sudah berapa lama anda tinggal di desa ini?

11. Do you involve in any community organization in this village? Yes___ No____
Apakah anda terlibat di organisasi masyarakat di desa ini? Ya Tidak

ECONOMIC ATTRIBUTE (ATRIBUT EKONOMI**)**

12. What is your main occupation?_____
Apa pekerjaan utama anda

13. Do you work for other people? Yes____ No____
Apakah anda bekerja untuk orang lain? Yes No

14. How long have been working for that job?_____
Berapa lama anda sudah bekerja di bidang tersebut

15. What is the percentage of your main occupation contribute to your total household income?_____
Berapa persentase pendapatan rumah tangga dari pekerjaan utama anda?

16. Do you have any additional occupation? Yes____ No____ How many?____
Apakah anda memiliki pekerjaan sampingan? Ya Tidak Berapa banyak?

17. Are there any of your household members currently working? Yes___No___
Apakah ada anggota keluarga anda yang bekerja? Ya Tidak

18. What is their occupations?
Apakah jenis-jenis pekerjaan mereka?

_____
_____

ENVIRONMENTAL ATTITUDE, BELIEFS AND VALUES
SIKAP, KEYAKINAN DAN NILAI TERHADAP LINGKUNGAN

19. Statements related to environmental Attitude, Beliefs And Values:
Pernyataan yang berhubungan dengan Sikap, Keyakinan dan Nilai terhadap lingkungan:

1. We have to take care of the land and the sea or it will not provide for us in the future.
Kita harus menjaga wilayah daratan dan lautan atau mereka tidak akan memberikan hasil kepada kita dimasa depan.

Strongly disagree	Disagree	DK	Agree	Strongly Agree
Sangat tdk setuju	Tidak setuju	TT	Setuju	Sangat Setuju

2. Fishing would be better if we cleared the coral where the fish hide from us.
Menangkap ikan akan lebih baik jika kita menghilangkan batu karang tempat ikan bersembunyi dari kita.

Strongly disagree	Disagree	DK	Agree	Strongly Agree
Sangat tdk setuju	Tidak setuju	TT	Setuju	Sangat Setuju

3. If our community works together we will be able to protect our resources.
   Jika masyarakat bekerja bersama, kita mampu melindungi sumberdaya hasil bumi/laut kita.

Strongly disagree	Disagree	DK	Agree	Strongly Agree
Sangat tdk setuju	Tidak setuju	TT	Setuju	Sangat Setuju

4. Farming in the hills behind the village can have an effect on the fish.
   Berkebun di tebing di belakang desa akan berpengaruh terhadap ikan dilaut.

Strongly disagree	Disagree	DK	Agree	Strongly Agree
Sangat tdk setuju	Tidak setuju	TT	Setuju	Sangat Setuju

5. If we throw our garbage on the beach, the ocean takes it away and it causes no harm.
   Jika kia membuang sampah dipantai, laut akan membawa sampah tersebut dan tidak akan menimbulkan bahaya.

Strongly disagree	Disagree	DK	Agree	Strongly Agree
Sangat tdk setuju	Tidak setuju	TT	Setuju	Sangat Setuju

6. We do not have to worry about the sea, God will take care of it for us.
   Kita tidak perlu khawatir tentang laut. Tuhan akan menjaganya untuk kita.

Strongly disagree	Disagree	DK	Agree	Strongly Agree
Sangat tdk setuju	Tidak setuju	TT	Setuju	Sangat Setuju

7. Unless mangroves are protected we will not have any small fish to catch.
   Hanya jika mangrove dilindungi, kita tidak akan mempunyai ikan-ikan kecil untuk ditangkap.

Strongly disagree	Disagree	DK	Agree	Strongly Agree
Sangat tdk setuju	Tidak setuju	TT	Setuju	Sangat Setuju

8. There are so many fish in the ocean that no matter how many we catch, there will always be enough for our needs.
   Ada banyak sekali ikan di laut, sehingga berapapun kita tangkap, jumlah ikan akan selalu mencukupi kebutuhan kita.

Strongly disagree	Disagree	DK	Agree	Strongly Agree
Sangat tdk setuju	Tidak setuju	TT	Setuju	Sangat Setuju

9. Human activities do not influence the number of fish in the ocean.
Kegiatan-kegiatan manusia tidak mempengaruhi jumlah ikan di laut.

Strongly disagree	Disagree	DK	Agree	Strongly Agree
Sangat tdk setuju	Tidak setuju	TT	Setuju	Sangat Setuju

10. There is a limit to the amount of seaweed farming that can be done in this area.
Ada batasan jumlah budidaya rumput laut yang bisa dilakukan di desa ini.

Strongly disagree	Disagree	DK	Agree	Strongly Agree
Sangat tdk setuju	Tidak setuju	TT	Setuju	Sangat Setuju

QUESTIONS AND STATEMENT RELATED TO MPA PLANNING AND MANAGEMENT PROCESSES
PERTANYAAN DAN PERNYATAAN YANG BURHUBUNGAN DENGAN PROSES PERENCANAAN DAN PENGELOLAAN MPA

AWARE OF MPA (PENGETAHUAN TENTANG MPA**)**

20. Have you ever heard of the expression of MPA? Yes_____ No_____
Apakah anda pernah mendengar istilah KKL/KPL? Ya Tidak

21. Have you ever heard areas where people are regulated to fish, capture animals or extract seaweed so the environment could be preserved?
Apakah anda pernah mendengar dimana ada pengaturan wilayah untuk penangkapan ikan, hewan laut dan budidaya rumput laut, dengan tujuan untuk melestarikan lingkungan?
Yes(Ya)___ No(Tdk)___

21. Have you ever been involved in any of the following MPA participatory activities:
Apakah anda pernah terlibat di kegiatan-kegiatan partisipatif MPA:

Public meeting (Rapat umum terbuka)	Yes(Ya)____	No(Tidak)____
Enforcement(Penegakan hukum)	Yes(Ya)____	No(Tidak)____
Monitoring(Monitoring/pengamatan)	Yes(Ya)____	No(Tidak)____
Advisory council(Lembaga penasehat)	Yes(Ya)____	No(Tidak)____
Volunteer(Tenaga sukarela)	Yes(Ya)____	No(Tidak)____
Education(Pendidikan)	Yes(Ya)____	No(Tidak)____
Work related activities(Kegiatan terkait pekerjaan)	Yes(Ya)____	No(Tidak)____
Others(Lain-lain)	Yes(Ya)____	No(Tidak)____

22. What is your main reason being involved with the MPA related activities?
Apakah alasan utama anda melibatkan diri dengan kegiatan-kegiatan terkait dengan MPA?

To learn_____ To support community_____ To maintain/to ensure livelihood_____
Untuk belajar Untuk membantu masyarakat Untuk menjaga kelangsungan pekerjaan

To protect environment_____ Others_____
Untuk menjaga lingkungan Lain-lain

23. What do you think about the amount of conflict in the community after the establishment of MPA?
Bagaimana pendapat anda tentang jumlah konflik di masyarakat setelah MPA ditetapkan?

Much worse__ Little worse___ Not changed__ Improved a little__ Improved a lot__
Sangat buruk Sedikit lebih buruk Tidak berubah Sedikit ebih baik Sangat baik

24. Do you think that the MPA is financially benefiting the local community?
Menurut anda, apakah MPA memberikan dampak positif terhadap keuangan masyarakat lokal?
Yes(Ya)____ No(Tidak)____

25. Do you think that the MPA has the same effect to all people in the community?
Menurut anda, apakah MPA memberikan dampak yang sama terhadap semua masyarakat lokal?
Yes(Ya)____ No(Tidak)____

26. What do you think about the coral reef condition before the establishment of MPA in your area?
Menurut anda bagaimana kondisi terumbu karang sebelum ditetapkannya MPA di tempat anda?

Very poor___ Poor___ Average___ Good___ Very good___
Sangat rendah Rendah Biasa saja Banyak Sangat banyak

27. What do you think about the coral reef condition after the establishment of MPA in your area?
Menurut anda bagaimana kondisi terumbu karang setelah ditetapkannya MPA di tempat anda?

Much worse__ Little worse__ Not changed__ Improved a little__Improved a lot__
Sangat buruk Sedikit lebih buruk Tidak berubah Sedikit lebih baik Sangat baik

28. What do you think about the number of fish catch before the establishment of MPA in your area?
Menurut anda bagaimana jumlah tangkapan ikan sebelum ditetapkannya MPA di tempat anda?

Very poor___ Poor___ Average___ Good___ Very good___
Sangat rendah Rendah Biasa saja Banyak Sangat banyak

29. What do you think about the number of fish catch after the establishment of MPA in your area?
Menurut anda bagaimana jumlah tangkapan ikan setelah ditetapkannya MPA di tempat anda?
Much worse__ Little worse__ Not changed__ Improved a little__Improved a lot__
Sangat buruk Sedikit lebih buruk Tidak berubah Sedikit ebih baik Sangat baik

30. Would you rate the overall MPA is successful? Yes(Ya)___No(tidak)____
Menurut anda apakah secara keseluruhan kegiatan MPA berhasil?

MPA RESOURCE USERS (PENGGUNA SUMBERDAYA**)**

31. Do you use MPA or waters nearby? Yes(Ya)____ No(Tidak)____
Apakah anda beraktifitas di kawasan MPA atau perairan sekitarnya?

32. What do you think about the fish abundance inside the No Take Area within the MPA in your area?
Menurut anda bagaimana kelimpahan ikan didalam zona larang tangkap di dalam kawasan MPA?

Very poor___ Poor___ Average___ Good___ Very good___
Sangat rendah Rendah Biasa saja Banyak Sangat banyak

33. What do you think about the fish abundance outside the No Take Area within the MPA in your area?
Menurut anda bagaimana kelimpahan ikan diluar zona larang tangkap di dalam kawasan MPA?

Much worse__Little worse__Not changed__Improved a little__Improved a lot__
Sangat buruk Sedikit lebih buruk Tidak berubah Sedikit lebih baik Sangat baik

MPA MANAGEMENT AND POLICY PROCESSES
PROSES PENGELOLAAN DAN KEBIJAKAN MPA

34. Statements related MPA management and policy processes
Pernyataan - pernyataan berhubungan dengan proses pengelolaan kebijakan MPA

a. Do you think to what extent your views were considered during the planning process of MPA?
Menurut anda, sejauh mana pendapat anda dipertimbangkan dalam prosess perencanaan MPA?

None(tidak sama sekali)____ Some(sedikit)____ All (semua)____

b. Do you think you can influence changes in MPA after established?
Menurut anda, apakah anda bisa membuat perubahan setelah MPA di tetapkan?

Yes(Ya)___ No(Tidak)___

c. How would you rate the clarity of decision-making process in MPA?
Bagaimana anda menilai kejelasan proses pengambilan keputusan mengenai MPA?

Not at all___	Little clear___	Clear___	Very clear___
Tidak jelas	Sedikit jelas	Jelas	Jelas sekali

d. Are the decision of MPA planning and management fair? Yes(Ya)__ No(Tidak)__
Apakah pengambilan keputusan mengenai perencanaan dan pengelolaan MPA cukup adil?

e. Were you provided with sufficient information during planning and management of MPA?
Apakah ada informasi yang cukup mengenai proses perencanaan dan pengelolaan MPA?

Yes(ya)____ No(tidak)_____

f. I trust the MPA organizer would do the best for community in this area.
Saya percaya pengelola MPA akan berbuat yang terbaik untuk masyarakat daerah ini.

Disagree____	Agree____	Strongly agree____
TIdak setuju	Sutuju	Sangat setuju

g. To protect the marine biodiversity is the most important goals in managing the MPA.
Melindungin keanekaragaman hewan dan tumbuhan laut adalah tujuan yang utama dalam mengelola MPA.

Disagree____	Agree____	Strongly agree____
TIdak setuju	Sutuju	Sangat setuju

SOCIAL RESILIENCE QUESTIONS
PERTANYAAN-PERTANYAAN MENGENAI SOCIAL RESILIENCE

35. Statements to measure social resilience
Pernyataan-pernyataan untuk mengukur social resilience

a. I can cope with small changes in my industry
Saya dapat bertahan dengan perubahan kecil di industry pekerjaan saya

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju

b. I am confident that I could get work elsewhere if I needed to
Saya yakin bahwa saya bisa bekerja dimana saja jika saya perlu

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju

c. I am interested in learning new skills outside of my industry
Saya tertarik untuk belajar keahlian baru diluar industry perkerjaan saya

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju

d. Every time there is a change, I plan a way to make it work for me
Setiap kali ada perubahan, saya selalu punya cara untuk bisa beradaptasi

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju

e. I cannot imagine myself in any other job
Saya tidak bisa membayangkan diri saya bekerja di bidang yang lain

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju

f. I have many options available to me if I decide to no longer work at this industry
Saya memiliki banyak pilihan yang ada jikalau saya memutuskan untuk tidak berkerja di industry perkerjaan ini lagi.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju

g. We are more likely to cope with changes compared to other families I know
Keuarga kami sepertinya bisa bertahan dengan perubahan yang terjadi dibandingkan dengan keluarga lainnya

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju

h. I feel like I belong to this community/town
Saya merasa saya merupakan bagian dari masyarakat/desa ini

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju

i. I always know how much money is coming in and out of my business
Saya selalu mengetahui berapa jumlah pengeluaran dan pemasukan keuangan dari pekerjaan saya

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju

j. We always have an amount of cash available for emergencies
Kami selalu memiliki uang tunai yang cukup untuk keadaan darurat

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju

k. I am having additional jobs that could produce fairly good income
Saya memiliki perkerjaan sampingan yang menghasilkan cukup uang

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju

l. I would be good at teaching younger people about the marine environment
Saya merupakan guru yang baik untuk generasi muda tentang kondisi lingkungan laut

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju

m. There are too many fishers in the region
Terlalu banyak nelayan di daerah ini

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju

n. I can easily find the information related to my industry
Saya dapat dengan mudah mencari informasi yang berkaitan dengan industry pekerjaan saya

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju

o. The friendships I have with people in this village mean a lot to me
Persahabatan yang saya miliki dengan masyarakat di desa ini berarti sangat penting buat saya

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju

p. The zonation of MPA helps to reduce the conflict between resource users.
Pengaturan wilayah pemanfaatan di dalam MPA membantu mengurangi konflik sesame pengguna sumberdaya

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju

36. Open ended question to explore the social resilience aspect:
Pertanyaan singkat untuk menggali lebih dalam tentang aspek social resilience:

a. How do you feel about working in this industry? (e.g. future prediction, potential income generated, likelihood of changing the job, conflict, etc.)
Bagaimana perasaan anda bekerja di industry ini? (prediksi masa depan, prediksi income, kemuningkinan untuk mengganti pekerjaan, tingkat konflik di pekerjaan, dll.)

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b. What do you think about this village? (the future of the village, relationship between people, the conflict, etc.)
Bagaimana pendapat anda tentang desa ini (masa depan desa, hubungan antara penduduk, konflik/pertengkaran di desa, dll).

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