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**UNDERSTANDING OF MARINE ENVIRONMENTS AND  
SUSTAINABILITY BY PRIMARY SCHOOL CHILDREN IN LOMBOK,  
INDONESIA**

A thesis  
submitted in partial fulfillment  
of the requirements for the degree  
of

**Master of Education**

By

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## **ABSTRACT**

Seagrass beds, mangrove forests and coral reefs as a part of marine environments play an important role in the coastal regions. These environments support the coastal communities by providing resources such as food and income. For many years, marine environments have been facing destruction the majority of which is caused by human impact. The lack of knowledge of how to use and manage the marine resources wisely and sustainably is one reason why marine environments are still facing degradation.

Primary school children who live in two coastal villages in Lombok Island, Indonesia were questioned about their conceptual understanding of their local marine environments and their ideas about sustainability in these environments. Using an interpretive methodology framework, children and their teachers from Grades 5 and 6 in two primary schools in coastal villages, and elders in the villages were studied and. The data gathered from the children through questionnaires and interviews, and from teachers and elders through interviews. Quantitative and qualitative analysis was used to analyse this data.

The children's experiences in their marine environment appear to have strong connection with their knowledge. Their knowledge also developed by interaction with the people in the communities. Children value their local marine environment as a place that provides food for them and their parents teach them to respect it. Long traditions such as dumping waste in the beach or sea has an impact on children from fishing families and creates a contradiction between the positive values they have and negative attitudes they act on. The children are not taught environmental education in the schools since it is not a compulsory subject and teachers lack knowledge about the marine environment.

Teachers and elders feel the importance of teaching about the marine environment to their children to give them the knowledge and ability to use the marine resources in sustainable way. For children who are a part of coastal communities, learning about their local marine environment should be made a priority to so they

have basic knowledge and understanding in using the marine environment in sustainable ways. Marine environmental education should not only educate children in formal school but also educate people in the communities. The coastal communities as a whole should be working together to achieve the aims of education and conservation. Additionally, the school as a whole needs to support the implementation of marine environmental education.

## Quote

*“If you plan for a year, plant rice  
If you plan for a decade, plant trees  
If you plan for a lifetime, educate people”*

Chinese Proverb

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# CHAPTER 1

## INTRODUCTION

### 1.1. Chapter Overview

This chapter outlines the impetus of the study and the context with a brief description. The next sections focus on justification which discusses purposes and the research questions, the scope and the significance of the research. The limitations of the research are outlined. To conclude this chapter, the overview of the structure of the thesis is provided.

### 1.2. Impetus of the study

My interest in the marine environment was kindled when my parents took me on my first diving course when I was 13. Since then, I have been fascinated by marine life and my parents have supported my interest by letting me travel to many parts of Indonesia to explore the beauty of Indonesian waters. My interest in the marine environment brought me to an eastern part of Indonesia to undertake a degree in marine science. After graduating, I worked in a local non-government organization on Lombok Island. I have been involved in a number of coral reef research projects. I have monitored several coral reefs and rehabilitated some areas by transplanting coral.

Some of my friends and colleagues have asked why I was only interested in coral reef ecosystems. In reflecting on this, I realize that when I was young, many peers and other people influenced my thinking that mangrove forests were not interesting places to know. They were muddy, dirty places. Another ecosystem, seagrass beds, was the same. These experiences have constructed my knowledge that those ecosystems are not interesting to learn about. Even during my university studies, my lecturers were not able to convince and encourage me to learn more about it.

My working experiences promoting marine conservation in the coastal region made me realize that other ecosystems beside coral reefs also play an important

role in the coastal regions and benefit the coastal environment itself and the communities near the coast. It is essential to pay attention to the coastal environments since some degradation has occurred in these ecosystems. Many issues in coastal regions occur because of the lack of conservation and protection of the marine environment, often due to a lack of knowledge.

### 1.3. The context of study



Figure 1 Indonesia archipelago map

(source: <http://earth.google.com>)

Geographically, Indonesia is located between the Asian and Australian continents and the Pacific and Indian Oceans. With more than 17,000 islands, Indonesia is known as the world's largest archipelago country in the world. The country, which lies along the equator line, is over 5000 kilometers in length and has the longest coastline in the world at over 80,000 km. Its unique geography means that Indonesia has a rich marine biodiversity which contains over 5,000 species of coral, 2,000 coral fish species, including 30 marine mammals, and six of seven sea turtle species. The marine and coastal environment includes beaches, sand dunes, estuaries, mangroves, coral reefs, coastal mudflats, tidal forests, and algal beds including small island ecosystems (Tomascik, Mah, Nontji & Moosa, 1997). The land area is relatively small compared to the surrounding water mass.



Figure 2 Lombok Island map

(source: <http://earth.google.com>)

Lombok is an island which is part of West Nusa Tenggara Province. This province consists of two big islands, Lombok and Sumbawa. Lombok is populated dominantly by Sasak and Balinese people and the remainders are migrants from Sumbawa, Java and many other parts of Indonesia. Sasak cultures are strongly influenced by the Balinese culture due to the history from when the country was ruled by the Balinese kingdom.

Tourism and agricultural sectors are the main income for the people. However, fisheries and aquaculture also contribute to the economic situation of local people. Sasak people have an agriculture lifestyle while people who live in coastal regions were migrants from Sumbawa and Sulawesi, a long time ago, but they are happy to be known as local people now.

West Nusa Tenggara Province has the lowest Human Development Index in Indonesia. One of the components of Human Development Index is education. In this province only 78% of people are literate and the average time of children attending school is only 6.6 years, which means they only finish their primary school. Accessibility and quality of education are indicators of education

outcomes. Many regions in Lombok Island are remote areas in which the access to education is limited. The accessibility depends on how communities are able to use facilities provided by the government. Since only primary schools are available in remote areas, the numbers of children who are able to go to high schools are low. The quality of education in Lombok still needs improvement. To teach at primary level, teachers need to hold a Diploma of Teaching. But Indonesia is now targeting in 2010 that primary school teachers should hold a Bachelor Degree to improve the quality of teachers. However, it becomes complicated since teachers have big tasks: on the one hand completing their degree and on the other hand, they have to fulfill their duty as teachers in the classroom. The teaching and learning becomes ineffective since sometimes substitutes for the teachers, for instance administration staff, who replace the main teacher are not capable of teaching. . The quality of curriculum and educational materials such as books is also variable.

#### *Formal Educational Systems in Indonesia*

Children start their schooling when they are four or five years old. They spend two years before they enter compulsory education - primary schools. Children spend 6 years at primary level and they have to pass a National Exam to enter the Intermediate Level. They spend 3 years at this level and need to pass a National exam to be able to continue their study to High School. The compulsory education is only 9 years (until Intermediate Level). The subjects that are taught in primary schools are Religion, Math, Bahasa Indonesia (Indonesian Language), Science, Civic Education, Sports, Arts and Local Content (teachers can choose between Culture, Language – foreign language, and Environment).

The Department of National Education launched the school-level of curriculum that gives authority to schools and to the teachers to develop their own curriculum. Since every region in Indonesia is uniquely different, local curriculum is the answer to instilling local knowledge about a region.

#### **1.4. Justification for the research**

The coastal regions are important for Indonesia. Coastal communities depend on the coastal environment for a living. Coastal degradation has occurred due to the lack of knowledge of coastal communities, forcing the government and non-governmental organizations to establish integrated coastal management areas. Since these projects do not cover many coastal regions and mismanagement occurs, the degradation of the coastal environment is still occurring. Additionally, it seems that children, as a part of coastal communities, have sometimes not been in touch with these projects. As the future generation, children should be educated as well as the adults. Primary school age is the right time to teach the basics of education, especially about the environment, especially as many children do not progress beyond primary school

Not much research has been done to investigate children's knowledge in Indonesia about their local marine environment. Although many non-governmental organizations (NGOs) have done activities to implement environmental awareness, the reports of outcomes of the programs are limited. Due to my own experiences with children who live in coastal areas, through beach clean-up and drawing activities, it seems from their drawing that they are not connected with their environment and in particular, the marine environment. I did not find children who drew marine animals or mangrove trees for example. Since West Nusa Tenggara Province is on the lowest Human Development Index, this research has become important in upgrading the quality of education - especially the marine environmental education among children who live in coastal regions.

I am interested in gaining timely benefits from the United Nations Decade of Education for Sustainable Development (2005-2014), as a starting point towards improving the primary education in coastal regions with regard to sustainability, both for communities and the environment. This research connects to the aims of the Decade that attempt to promote and improve the quality of education, reorient the curricula, raise public awareness and educate the employed. Since the United Nations launched the Decade of Sustainable Development in the past few years, this is the best time to act.

#### ***1.4.1. Purpose of the research***

This research sought to examine children's knowledge and views about their local marine environment and its sustainability. It also examined the views of their teachers and members of their communities on the same issues. The results of the research may be useful for developing local curriculum which is appropriate for local issues.

#### ***1.4.2. Scope of the study***

Analysis of the situation involved 74 primary school children, with 29 children from fishing families and 45 children from non-fishing families, and finding out about their knowledge and views about their local marine environment and its sustainability. The children were from Years 5 and 6 and involved their teachers as well. Six elders from two coastal villages where the schools were located were also involved.

#### ***1.4.3. Significance of the research***

The findings may be beneficial for curriculum developers, environmental educators, local government, or NGOs which work on marine environmental issues. The results may benefit development of curriculum to meet the local issues and needs.

### **1.5. Research questions**

Initially I identified what I am trying to find out and wrote down numerous interesting questions to ask. After reshaping the questions, I considered these questions, as follows:

1. What knowledge and conceptual understanding do primary school students living by the sea in Lombok, Indonesia have about their local marine environment?
2. What ideas do primary school students living by the sea in Lombok, Indonesia have about sustainability in their local marine environment?

3. What differences exist in the knowledge and conceptual understanding and ideas about sustainability in the local marine environment for primary school students living in communities that depend on their local marine environment in different ways?

### **1.6. Limitations of the research**

This research involved primary school children from fishing and non-fishing family backgrounds, their teachers and the elders who live in a coastal region of Lombok. Generally, the characteristics of coastal villages in Lombok Island are isolated due to the road conditions and the low economic incomes. Research involving the coastal communities, especially school children, is limited. It means children are not familiar with questionnaires, interviews and any methods of research. There might be bias on answering or analyzing the data for this reason.

### **1.7. Thesis structure**

Chapter 2 is the review of the literature. Chapter 3 outlines the methodology. It explains the paradigm underpinning the research, the process and the quality of the research and ethical issues are also considered. Chapter 4 presents findings of the research. Chapter 5 discusses issues emerging from the findings, the implications of the research and provides the conclusion.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1. Chapter overview**

This chapter presents literature relevant to the research questions discussing student's knowledge, their values and attitudes toward the local marine environment, and their ideas about sustainability in relation to the place where they live. It begins with discussion on conceptual understanding and a number of factors that influence the student's conceptual understanding. This review draws attention to the concept of sustainability and explores students' ideas of this concept with their values and attitudes. This chapter also reviews literature on the marine environment within an Indonesian context.

#### **2.2. Students' knowledge and conceptual understanding**

Concepts are defined as objects, processes or events that can be recognized by the commonalities which allow us to label and distinguish them (Cin & Ozcelik, 2002; Novak, Mintzes & Wandersee, 2000). A concept does not stand alone since it develops relationships to form propositions. A proposition is the explanation of the function of various aspects of the universe (Novak et al., 2000). Furthermore, the concepts are apparently designated by a sign or symbols that compose language, which means people are able to communicate them (Mintzes & Novak, 2000).

Novak et al. (2000) point out that the knowledge is built from concepts, and the connections between concepts create the primary epistemological beliefs. Concepts become important since they make up the basic unit of meaning and are important in knowledge development (Mintzes & Novak, 2000). They highlight understanding as a result of conceptual development, which is what gives objects and events meaning in the actual world. In order to develop understanding about a concept, it is necessary to recognize the elements and the relationship between them (Cin & Ozcelik, 2002). People learn a new concept by approaching it through related knowledge. Generally, children at an early age have already

learned to identify a specific concept and their understanding of it develops as they grow up (Mintzes & Novak, 2000).

Cin and Ozcelik (2002) highlight some research about the concepts of nature – some of which are easy for children to understand and others are not. Barker (2008) mentioned three things that influence the children's ability to learn. Firstly is children's experiences, secondly is their unique ability, and thirdly is their psychological aspects including children's capability for risk-taking, self-efficacy, adaptability and curiosity.

The following discussion draws attention to constructivist theory which is important in explaining developing conceptual understanding in students.

### ***2.2.1. Constructivist theory***

Fosnot (2005) stated that constructivism is a theory about knowledge and learning that illustrates knowing and how someone knows about something. Constructivists are interested in how people obtain conceptual knowledge through the process of understanding. To understand the world around them, people internalize the concepts that they gain from everyday and scientific knowledge, and use it to construct their own personal understanding (Smith, 2003). In other words, in constructivist theory, people learn to make sense and make meaning of new knowledge and learn to add it to their existing knowledge (Gipps & MacGilchrist, 1999). Constructivists are also interested to find the interactions between prior and new knowledge that make the process of meaningful learning important (Smith, 2003).

Piaget was leading the way in constructivism theory. Clark (2005) highlighted Piaget's theory of learning in which learning depends on the people's knowledge and how they interact with their environment. People construct their knowledge by accommodating their existing knowledge with the new knowledge they received. This is an active process and an individual can accept or reject the new knowledge based on their experiences.

Gunstone (2000, cited in Clark, 2005) reviewed the constructivist theory of learning, and underlined that the learning environment and the knowledge of learning influenced the learning outcome. The learner constructs meaning from their experiences and this is influenced by their existing knowledge. This is an active process by which the learner can accept or reject new knowledge and finally it is the learner's responsibility. The construction of meaning is also influenced by the learner's experience in their interactions with the world. However, it was a limitation in Piaget's work that he did not offer a clear explanation of the process of learning. Cognitive science is a theory that offered a suitable explanation for the process of learning.

From Vygotsky's theories, the social factor has become one of the essential functions in child development (DeVries, 2000). Vygotsky expanded the cognitive science in which social context is important as a part of learning - and developed it as social constructivism. Vygotsky (1962) stated that children construct their knowledge not only from their mind but also from their social engagement with other people through their interactions. In addition, Gipps and MacGilchrist (1999) point out that the understanding of how learning takes place has changed critically. Except for personal experiences, people construct their knowledge through social interaction with other people. When individuals interact socially with others, they construct knowledge through communication, and the process of learning is influenced by the individual with more knowledge (Driver et al., 1994).

Bruner proposed socio-cultural constructivism where both social and cultural contexts are taken into account. Leach and Scott (2003) highlighted the socio-cultural view that learning in making sense and making meaning is developed from social interaction between individuals and cultural sources. In other words, individuals gain knowledge, not solely from themselves, but through the development of interaction with others (Gipps & MacGilchrist, 1999). Although social constructivism did not specifically mention culture, its ideas are the same, with a socio-cultural view of learning in which verbal and conceptual networking are important (Barker, 2008). Fosnot and Perry (2005) added that learning is not

the development outcome; learning is development which is the outcome of activity and self-organization of the learner.

Research has been conducted by Loughland, Reid and Petocz (2002) to discover the social and cultural influences on environmental understanding among Australian children aged between 9 – 17 years old. They used a phenomenographic analysis to look at their understanding about the concept of the environment. They identified six categories:

1. The environment is a place;
2. The environment is a place that contains living things;
3. The environment is a place that contains living things and people;
4. The environment does something for people;
5. People are part of the environment and are responsible for it; and
6. People and the environment are in a mutually sustaining relationship.

Loughland et al. distinguished the first three categories, in which children saw the environment as an object, from the last three categories which show that children look at the connection between the environment and themselves.

Kusmawan, Reynolds and O'Toole (2006) state people's experience has an influence on how they construct a boundary with their environment and the quantity of these experiences is dependent on how they interact with their society and environment. Barker (2008) noted particular life experiences influence children in learning.

Cin and Ozcelik (2002) describe a number of environmental psychology research studies (Goodnow, 1970; Robertson, 1994; Bonnes & Secchiaroli, 1995) which illustrate that the difference in physical environments has a direct influence on an individual's personality, behaviour, environmental perception and visual thinking. Cin and Ozcelik (2002) discussed the research by May (1998) about the theories on children's first-hand experience and their influence on a child's conceptual understanding. It showed that children's local environment had made an impact on their understanding about a river. In the study, children who lived

close to the Devon estuary, in general, were able to explain the concept about the final destination of the river.

Cin (1999, cited in Cin & Ozcelik, 2002) studied the relationship between children's direct experience of the physical environment and their conceptual understanding of it. Two groups of children living in different geographical areas were selected to study the influence of the physical environment on their understanding. This study sought their understanding on selected objects related with their environment. The results supported the statement that experience of a physical environment has an influence on children's conceptual understanding.

In addition, Loughland et al. (2002) highlight the study conducted by Cullingford (1996) which argues that young people are concerned with the issues in the environment which will affect them. Cullingford gave an example that children will consider pollution because they have had their own experiences of pollution. However, Fransson and Garling (1999) highlighted lack of knowledge is one factor that explained why environmental concern is low.

In summary, students as learners construct knowledge through interactions with their environment and their community. Experience is one of the factors which may affect this development of conceptual understanding. The next discussion is how their experiences influence the children to act.

### ***2.2.2. Connectedness of experiences to actions***

Jensen and Schnack (1997) described action oriented learning in terms of activities in natural settings, such as investigations into biological, physical and chemical aspects of water. These would be valuable as they will assist students to increase their knowledge. However, action in this context does not stop here. There should be solutions to a problem - as a focus of action - and this needs to direct the focus of action.

Mogensen (1997) highlights habits, customs, religions and prejudices as the background that leads people to act in dealing with environmental issues. An issue

will lead people to make decisions to act, which should solve a problem directly. At this point, the action should be based on the understanding and can be explained through motives and reasons for a particular action, rather than mechanisms and causes (Schnack, 1977, 1994, cited in Jensen & Schnack, 1997). Action can be taken individually or collectively (Jensen, 2002).

Competence is related to being able and willing (Jensen & Schnack, 1997). A science-oriented approach to environmental education has been shown to produce knowledge about environmental issues but not to lead to solving the problems as a part of action competence (Jensen & Schnack, 1997). Breiting and Mogensen (1999) highlighted that through action competence, students will be capable of dealing with environmental issues. Furthermore, without action competence, students will not have fruitful experiences that will assist them to succeed in carrying out action (Jensen & Schnack, 1997).

### **2.3. Values and Attitudes**

Individuals have different values and attitudes based on their experiences. These values and attitudes are sometimes influenced by philosophy and religion in different societies, and also have an impact on how people act towards nature (Yencken, 2000). In addition, Ballantyne (2004) indicated that students learn to understand the world through their concepts such as models and theories and also through the values, belief and attitudes which they develop from their experiences. The role of values and attitudes is discussed next.

#### **2.3.1. Values**

Values are normative views about the world. Values are concerned with the way the world ought to be, not just with the way the world is (Yencken, 2000). Scheibe (1970) states values are the actions of wishes, desires, goals, passions, valences or morals. The values interact between a person and their environment. According to Rokeach, (1968) “a value is a standard or yardstick to guide actions, attitudes, comparisons, evaluations, and justifications of self and others” (p.160). Values refer to certain of motivational concerns that people need to handle their individual, social and social institutional needs (Rokeach, 1973).

Values have been studied in many disciplines such as sociology, economics and philosophy. Values have been discussed as the aspects that influence what people think about, and their behaviour toward, the environment. However, values do not stand alone, since people's decisions to act are influenced by other aspects such as norms or beliefs (Dietz, 2005). According to Hansla, Gamble, Juliusson and Garling (2008), a number of values have direction toward positive environmental attitudes and behaviour. Schultz et al. (2005) highlighted the importance of values in understanding attitudes about environmental issues, showing a link between attitudes and values. Additionally, Schultz et al. (2005) highlighted the work of Stern and his colleagues who tried to apply the Schwartz model of human values to their research about environmental attitudes and behaviour. They addressed the theory about environmental attitudes and behaviour as being the result of how people become conscious of valued objects. Valued objects are focused on self, other people, or all living things.

A hypothesis proposed by Dunlap et al., (1975, cited in Dietz, Fitzgerald & Shwom, 2005) uses Maslow's hierarchy<sup>1</sup> that people will have positive values toward the environment after their basic needs have been met. It is related with the study proposed by Diekmann and Franzen (1999; Franzen, 2003, cited in Dietz et al., 2005) which discovered that developed countries put greater priority on environmental issues than developing countries although there are indications now about environmental concerns in developing countries. This is related to the fact that the majority of people in developing countries are still struggling to fulfil their basic needs, such as food, clothes and shelter.

Values influence our thinking about what action we should take in terms of environmental issues. However, values are just one of the factors that influence our decisions. Attitudes are closely related.

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<sup>1</sup> Maslow's hierarchy of need is theory in Psychology proposed by Abraham Maslow. It is described in his paper, A Theory of Human Motivation, about five levels of human needs.

### **2.3.2. Attitudes**

Eagly and Chaiken (1993) define an “attitude as a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor” (p. 1). Dietz et al. (2005) defined attitudes as positive or negative evaluations of a particular object. According to Rokeach (1968), “An attitude is a relatively enduring organization of beliefs around an object or situation, predisposing one to respond in some preferential manner” (p.112).

Attitudes deal with several phenomena as a result of individual interaction between them and the society where they live (Albarracin, Kumkale, Johnson & Zanna, 2005). Attitudes are the results of complex cognitive processes since they come out in different forms (Krosnick, Judd & Wittenbrink, 2005). From psychological literature, attitude has been argued to have three dimensions. The first is cognition including knowledge that is characterized in every individual and their beliefs that control the level of certainty of, for instance, what is true or false and desirable or undesirable. The second dimension includes feelings in certain situations that affect an individual or group, causing a stance of positive or negative attitudes and given values toward the object of belief. The third dimension is the connotation of coping with behavioural intent because there are reactions of various thresholds that guide people to take some action (Rokeach, 1969; Yencken, 2002).

Kahle (1984) described person-oriented and situation-oriented theories that influence attitude changes. Person-oriented theories deal with the individual experience. The individual’s perceptions are essential in how they perceive the world. The situation-oriented theories focus on what, outside the individual, influences perception and predict an attitude change. This includes the physical and social environment around them. Axelrod and Lehman (1993) discussed the concept of attitudes and how some factors will lead an individual to act: I believe, therefore I act (this leads to the idea of attitudes as direction to behaviour); I can, therefore I act (this exposes the notion of value or personal rule that leads behaviour); I desire, therefore I act (this recognizes the motivational strength of individual and how they achieve particular outcomes from their actions). Some

research by Sherif (1980), Sivacek and Crano, (1982), and Krosnick, (1989, 1990) proved that people tend to act if the issues are personal and related to them and tend not to act if the issues are not related to them. Simply, people's beliefs and feelings and the values they have towards an issue or behaviour will lead to how they decide to act. For these reasons, people's attitude toward the environment can be expected to influence their actions toward the environment (Axelrod & Lehman, 1993).

Schultz et al. (2005) stated that environmental attitudes correspond to the set of beliefs, affect and behavioural meaning that individuals hold in connection with environmental issues. Understanding how people's attitudes toward the environment and the aspects that influence how people act are important in improving society's attitudes toward the environment (Tikka, Kuitunen & Tynys, 2000). Furthermore, they highlighted the strong correlations between knowledge and experience, and attitudes toward the environment. When people understand this correlation, this will improve their attitudes toward the environment.

Kusmawan et al. (2006) pointed out that students' participation in environmental action could assist them in developing their ecological affinity. By being actively involved in environmental learning, students will gain attitudes and motivation to learn. Experiences in dealing with environmental issues and engagement with the community could shape their understanding of their environmental rights and responsibilities. These rights and responsibilities may vary according to the socio-cultural aspect within which the students live.

### ***2.3.3. Socio-Cultures***

Fien (2002) described research in various countries that have their own cultural traditions which influence the pattern of environmental knowledge, attitudes and behaviour including religion and indigenous culture, and how these play an important role. It is possible to accept three common ideas in a cultural background: traditions of stewardship and concern about the environment; the pressures leading to the environmental conditions in each country; and the several responses being made.

For example, Indonesia, with 17,836 islands, has many different cultures, ethnicities and languages. Even in one region, cultures might be different. Due to history, cultures in Indonesia have been influenced by different countries, for example Chinese, Arabic, Portuguese, Spanish and the Dutch who came to Indonesia for different reasons such as trade and colonization. Each region in Indonesia may therefore have a separate socio-cultural background influencing environmental behaviour.

Indian culture views all living things as sacred and to be worshipped (Fien, 2000). Generally, there are three major Indian religious traditions: Hinduism, Buddhism and Jainism. As Indonesia has had Hindu traditions for a long time, many cultures reflect these traditions, particularly in some parts of Java, Bali and Lombok, there are long traditions of respecting Mother Nature by performing a variety of ceremonies.

In modern Indonesia the religion of Islam is common. In the Islamic religion, the important thing is a relationship of stewardship with the Quran, which guides followers to protect God's creation (Fien, 2002). Even though the majority of Indonesian people are Muslim, many of them still practice traditions of animism. Like Indonesia, Brunei is a country with a Muslim majority and guided by Islamic ethics. Some traditions, such as superstitions and taboos, have persuaded them to have good manners and to greatly respect the environment (Cheong, 2002). In addition, social norms influence the attitudes to act (Newhouse, 1990, cited in Fransson & Garling, 1999).

In summary, values and attitudes are linked to experience and knowledge. These factors combine to lead people to behave and act in certain ways towards the environment. This study examines the experiences, knowledge, values and attitudes of primary school children and members of their communities in Lombok in relation to their marine environment.

## **2.4. The marine environment**

The marine environment is possibly the most common environment in the world. Because of its complexity, it is difficult to understand as a whole (Nybakken, 2001). Due to this complexity, in this study I chose to focus on the areas of marine biodiversity, people and the marine environment, and marine environment issues. The study sought to investigate the students' understanding about these aspects and their values and attitudes to the marine environment.

### ***2.4.1. Marine biodiversity***

The Convention on Biological Diversity at the UN Conference on Environment and Development in 1992 in Rio de Janeiro defined biological diversity, commonly written as biodiversity, as “The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species and of ecosystems” (cited in Gray, 1997, p.154). Tomascik, Mah, Nontji and Moosa (1997) highlighted that biodiversity of a particular region involves the complex interactions between physical, chemical and biological aspects including geological history. In the Biodiversity Convention, an ecosystem is defined as “A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit” (cited in Gray, 1997, p.157).

Tomascik et al. (1997) describe the Indonesian Archipelago as one of the richest regions of marine diversity in the world. However, this marine diversity in Indonesia is not well known and documented. Three distinct ecosystems that are common in Indonesian marine environments are seagrass beds, mangrove forests and coral reefs. Each of these is now discussed.

#### ***2.4.1.1. Seagrass beds***

Seagrass beds are found in estuaries and lagoons and they have association with mangrove forests and coral reefs (Nybakken, 2001; Tomascik et al., 1997).

“Seagrasses are flowering plants adapted to live submerged in seawater” (Nybakken, 2001, p.210). Tomascik et al. (1997) mentioned that seagrass is commonly similar to terrestrial grass because it flowers, pollinates, produces fruit and disperses seed. Some physical factors such as currents and waves strongly influence seagrass growth. Seagrass beds are one of the most productive areas in the ocean (Nybakken, 2001) and are found in South-East Asia (Hogarth, 2007). Indonesia has 14 species of seagrass (Mimura, 2006). According to Tomascik et al. (1997), seagrass diversity in Indonesia is relatively low although the habitat diversity is among the highest in the world.

The characteristic of seagrass in the Indonesian Archipelago is a soft-bottom habitat. The seagrass form could be in mixed or mono-specific meadows. In Lombok Island, seagrass communities are typically composed of eight to ten species and this is common in other regions in Indonesia. Atmadja (1992, cited in Tomascik et al., 1997) stated that fishermen in the west coast of Lombok collected seven species of seagrass (*Eucheuma arnoldi*, *E. spinosum*, *Galidiella acerosa*, *Gelidiopsis intricate*, *Gracillaria eucheumoides*, *G. lichenoides* and *Hypnea cervicornis*) from mixed seagrass meadows.

Tomascik et al. (1997) noted that the seagrass communities have a huge variety of benthic, demersal and pelagic organisms. The characteristics of seagrass communities are either permanent residents or transients. Many transient species are seeking food and shelter during their particular life stage. Some of them have economic value, such as prawns and shrimps. Bivalve molluscs such as mussels and clams are common in seagrass beds, attached to rhizomes or leaves. Amphipods, isopods shrimps, crabs, copepods, and ostracods are among the crustaceans that are found in seagrass beds. Echinoderms such as sea urchins and sea cucumbers are found easily in seagrass beds. The *bêche-de-mer* or trepang (*Holothuria* spp.) and *Synapta maculata* are commercially important. Fish are abundant in seagrass beds. *Chelonia midas* or green turtle and *Dugong dugong* or dugong are the main consumers in seagrass beds in the Atlantic, Mediterranean and Indo-Pacific (Nybakken, 2001; Tomascik et al., 1997).

Seagrass beds are the main productive source of food (in the form of detritus) for many species in shallow water around the world. They also function as shelters for many organisms and the beds as nursery grounds for a number of commercially important species, for instance shrimps and scallops (Nybakken, 2001).

#### 2.4.1.2. Mangrove forest

Mangrove forest or mangal contain species of trees or shrubs that grow in salt water. According to Hogarth (2007), mangroves are defined “as woody trees and shrubs which flourish in mangrove habitats (or mangals), which is almost, but not quite, a tautology” (p.2). Mangrove forest covers 60-70% of the area of tropical coastline in the world (Nybakken, 2001). The geographical distributions of mangrove are influenced by tides (Nybakken, 2001) and temperature (Hogarth, 2007). Most of the world’s mangrove forests are spread in Asia and Pacific islands, with 40% found in Asia. Indonesia has the largest area of mangrove because of its long coastline (Mimura, 2006).

Vertebrates such as reptiles, birds and mammals are found in mangrove habitats. Snakes and lizards are among the reptiles that are common in mangrove forests. Birds usually found in mangrove forests include herons, egrets and kingfishers. In South-east Asia, monkeys such as langurs or leaf monkey (*Presbytis* spp.) and striking Proboscis (*Nasalis larvatus*) are common in mangrove forests. Fruit bats and flying fox (*Megachiroptera*) are also easily found in mangrove forest (Hogarth, 2007).

*Brachyura* or true crab is an abundant crustacean in mangroves. A gastropod that is common in mangrove forest worldwide is *Thais*, a form of snail. Fish such as anchovies, catfish, mullets and archerfish are dominant during high tides. Mudskippers in the *Gobies* family are found easily in low tides (Hogarth, 2007).

The mangrove forest functions as a nursery and spawning ground for some commercially important fishes, crustaceans, molluscs and reptiles (Mimura, 2006; Nybakken, 2001; Raven, Berg & Johnson, 1998). The birds use mangrove tree

branches for nesting and the roots stabilize the submerged soil, preventing coastal erosion (Raven et al., 1998).

Mangrove forests in the Indonesian Archipelago have economic and social development value for coastal communities. Mangrove forests have another function as physical barriers from waves. Timber for boats and construction, firewood, charcoal, honey production and medicines are products from mangrove forests that coastal communities benefits from (Hogarth, 2007; Tomascik et al., 1997).

#### *2.4.1.3. Coral reef*

The coral reef is the most productive ecosystem in coastal regions (Howe, 2001; Nybakken, 2001; Raven et al., 1998). Coral reefs with high species diversity are among the most productive systems in the marine environment. Temperature, depth, light, salinity, sedimentation and emergence into air are main factors that strongly influence coral reef growth (Nybakken, 2001). In Indonesia, the total area of coral reef is approximately 85,200 km<sup>2</sup> (Nunn, Keally, King, Wijaya & Cruz, 2006).

Coral reef is a habitat for hundreds of species of fishes and invertebrates, such as giant clams, sea urchins, sea stars, sponges, brittle stars, sea fans and shrimp. The major feeding type of fish are carnivores that comprise 50-70% of fish species, followed by herbivores and coral grazers, for example, the families *Scaridae* and *Acanthuridae*. The rest are omnivores, commonly from families *Pomacentridae*, *Ostraciontidae* and *Tetraodontidae*. A small number are zooplankton feeders, for instance *Pomacentridae*, *Clupeidae* and *Atherinidae* (Nybakken, 2001).

#### *2.4.2. Marine environment issues*

The marine environment conditions have been in decline for two major reasons: natural disasters such as hurricanes and typhoons, and human activities (Hogarth, 2007; Nybakken, 2001). Gray (1997) highlighted a number of threats in the coastal environment such as habitat loss, overexploitation including destructive

fishing methods, pollution, tourism, marine litter and people who have limited perceptions of marine life. However, human activities are probably the biggest threat to the marine environment. This is particularly the case for the three marine ecosystems discussed above.

### *Seagrass beds*

The major cause of seagrass bed destruction is coastal construction activities, such as dredging shipping channels (Hogarth, 2007). In Indonesia, seagrass beds have been lost over the past 50 years for aquaculture purposes and 60% of these were in Java (Mimura, 2006). Tomascik et al. (1997) and Fortes (1988) identify natural stresses in seagrass such as cyclones, volcanic eruptions, tsunamis, and competition among seagrass communities.

### *Mangrove forest*

People have been using mangrove forests for many purposes. People take mangrove trees for firewood, charcoal, wood chip and pulp production (Mimura, 2006; Nunn et al., 2006; Nybakken, 2001; Raven et al., 1998). Mangrove forest clearance for shrimp aquaculture has also been causing mangrove degradation (Nybakken 2001; Nunn et al., 1998), particularly in South-east Asia areas, such as Indonesia (Mimura, 2006).

### *Coral reefs*

Hurricanes and typhoons, *Acanthaster planci* and coral bleaching are three natural causes of mass mortality on reefs (Nybakken, 2001). Human activities such as dredging, mining, and overfishing have been major causes of coral reef destruction (Nybakken, 2001). In addition, Mimura (2006) describes destructive fishing practices such as using dynamite and cyanide, and coastal development including tourism facilities as being main problems in coastal regions. Coral reefs are also damaged by fishing equipment, divers' interactions and boat anchors (Mimura, 2006).

Tomascik et al. (1997) provided a summary of these critical marine and coastal ecosystems in Indonesia and the key points are:

1. Mangroves have value for coastal fisheries and as critical ecosystems, and function as storm protection. Mangroves can be stressed by conversion to other uses and overexploitation and possible impacts of these stresses are loss of production and loss of ecosystem function.
2. Seagrass beds have a function for fisheries breeding, nursery and feeding habitats and a value as a critical ecosystem. Seagrass beds can be stressed by overexploitation, land – based pollution and inappropriate coastal development. The possible impacts of stresses are loss of ecosystem function, loss of fisheries and loss of critical habitats.
3. Coral reefs have value as critical ecosystems, and for fisheries and tourism. Coral reefs can be stressed by overexploitation, coral mining and unsustainable use. The possible impacts of stresses are coastal erosion, loss of ecosystem function and loss of fisheries

In Indonesia, particularly on Lombok Island, these three marine and coastal ecosystems play an important role in supporting basic needs and economy for local communities. Since local communities totally depend on their environment, they tend to exploit these ecosystems. If local communities continue with these practices, it will be guaranteed that the future generations will not be able to have maximal use of the resources.

#### ***2.4.3. Marine conservation***

Although the Indonesian Archipelago has the greatest marine diversity in the world, it has also received the greatest degradation due to the impact of humans. The coastal regions need to be rehabilitated by conservation of the habitat and landscape diversity. The conservation efforts will ideally not only conserve the regions with the highest diversity but also the regions in which the diversity is low (Gray, 1997). Human activities are the major source of degradation, particularly in the coral reef ecosystem. Inadequate planning and coastal management also cause

marine ecosystem problems. Tomascik et al. (1997) pointed out that, generally, coastal communities have a lack of knowledge of how the marine ecosystem works and the interdependence among the marine habitats, and this knowledge lack makes degradation worse around the world. Moreover, coastal communities concentrate on exploring the marine environment for consumption purposes rather than for conservation (Gray, 1997).

Conservation should make sure that besides protection of biodiversity, the coastal communities will be able to meet their needs for living. The balance between protection and sustainability should be carefully applied (Gray, 1997).

Since local communities depend on the environment for their livelihood, we have to make sure they can still use the resources wisely for today and for future generations. Through marine conservation, the marine environment will improve, resulting in benefits for the communities.

In Lombok Island, a number of projects of marine conservation have been carried out. However, they have not involved every level of the communities, such as children. I am sure, by educating children about the marine environment and its conservation, they will be able to face these issues.

## **2.5. Sustainability**

The environment provides every component that people need to live. People are totally reliant on the environment for their livelihood. However, sometimes, people forget to treat the environment carefully and become destructive, causing the environment to become unbalanced. Pollution in air, land and water and loss of biological diversity are examples of how people have made a negative impact on the environment (Diesendorf, 2000).

According to Shields, Solar and Martin (2002), in the late twentieth century, it was realized that there were major problems in the environment. People began to understand that people exist because they depend on what the biological, physical and chemical system of the earth can provide for them and learned that they ultimately depend on the environment for their life. Dunphy and Benveniste

(2000) highlighted that improving the quality of the environment is a necessity, which means that people must constantly be improving, maintaining and protecting every element in the environment and to continue this for present and future generations. These activities lead to sustainability.

### ***2.5.1. Definition of sustainability***

There are many different standpoints about sustainability. It depends on how people think in different political ideologies and programmes - all stressed according to different kinds of knowledge, values and philosophy (Huckle, 1996). “Sustainability is more a symbol than a scientific concept” (Dunphy, 2000, p.251) and it cannot be described in a scientific way. Nevertheless, people understand that the sustainability concept contains the fundamentals to deal with environmental, social and economic aspects in decision-making (Gilding, 2000).

The term sustainability was first used by the World Conservation Strategy (Tilbury, 1995), followed by the World Commission on Environment and Development which produced the Brundtland Report which looked at:

1. The need for reconciliation between economic development and environment conservation;
2. The need to place any understanding of environmental concerns within a socio- economic and political context; and
3. The need to combine environment and development concerns. (WCED, 1987)

The Brundtland report described sustainability by suggesting it is the integration of the environmental, social and economic in development as well as the interdependence between humans and nature and between present and future generations. Since that report a number of authors have developed this thinking further.

Sutton (2000) pointed out that sustainability has the purpose of taking care of social, ecological and economic factors already existing. This process guides toward sustainable development. It encompasses forms of social and economic

development that maintain the environment, social equity and human well-being (Diesendorf, 2000).

Dunphy and Benveniste (2000) categorized sustainability into ecological sustainability and human sustainability. Ecological sustainability proposes to redesign every aspect that plays a role in sustainable economic development and to renew and protect the environment. Yencken (2000) explained a number of scientists have the same opinion about four basic concepts, in that sustainability is needed to maintain biodiversity, protect natural capital, maintain the balance of energy and material cycles, and maintain health. Additionally, it is essential to understand other concepts in achieving sustainability such as the concepts of interdependence and carrying capacity, the precautionary concepts and the intergenerational equity concepts (Yencken, 2000).

On the other hand, human sustainability proposes to develop human potential to sustain well-being. As sustainability is interdependent between humans and the environment, Capra (2005) added that a sustainable community is defined as having the capability to provide the needs and goals of the present society without diminishing the opportunities of future generations.

### ***2.5.2. Environmental Education and Education for Sustainability***

The environmental education movement appeared through a series of international conferences in the early 1970s. The first international conference focused on environmental education was held in Yugoslavia in 1975 and produced The Belgrade Charter which presents the position and range of environmental education. In 1977, the first Intergovernmental Conference on Environmental Education was held in Tbilisi, Georgia. At this meeting, the Belgrade Charter was developed and refined. The objectives and the ideology of environmental education are mentioned clearly in The Tbilisi Declaration (PCE, 2004).

The key dimensions of environmental education were proposed by Arthur Lucas for the first time (Barker & Rogers, 2004). Environmental education is education *about*, *in* and *for* the environment. The education *about* the environment highlights the development of awareness, knowledge and understanding about

human and environmental interaction. The education *in* the environment highlights the development of awareness and concern through direct experience with the environment. The education *for* the environment highlights the development of a sense of responsibility and motivation to act to deal with environmental problems.

Tilbury (1995) noted that it was in the 1990s when people became concerned about changing to educational approaches that would address the environmental and development issues. New educational approaches should not only address the environmental problems but also have goals towards sustainability in the long term. Hicks and Holden (2007) argued that environmental education has not placed the future as a part of its dimension. In the late 1990s the concept of education for sustainability was initiated, and considered, as a reflection, that it should be able to meet the present and future needs of the next generation (Fien & Tilbury, 2002). Education for sustainability has been illustrated as a critical, holistic and participatory approach that looks for a change from individual and community to deal with sustainability issues (Sterling, 1996). In addition, Huckle (1996) points out that the essential meaning of education for sustainability is to assist people to ponder and take action and understand that they have a better future that will be more informed in democratic ways (Huckle, 1996). Education for sustainability identifies the work of environmental education as being enabling people to understand and carry out sustainable practices. Many of the roots of education for sustainability have expanded from the environmental education movement (PCE, 2004).

In 1991, the World Conservation Union (IUCN), the United Nations Environment Programme (UNEP) and the World Wide Fund for Nature (WWF) launched a strategic plan named Caring for the Earth that pondered on the process of living sustainably. This strategic plan highlighted the position of education in carrying changes toward sustainable lifestyles (Tilbury, 1995; Fien & Tilbury, 2002). The Earth Summit Conference held in Rio de Janeiro in 1992, had, as its main outcome, an agreement known as *Agenda 21*, a key action programme which established what nations should do to achieve sustainable development in the twenty-first century (Palmer & Neal, 1994). *Agenda 21* identified that education

was critical for movement towards sustainability and called for the re-orientation of environmental education towards sustainability (Tilbury, 1995).

Chapter 36 of *Agenda 21* recommends reorienting education to endorse general public understanding, systematic analysis and support for sustainable development (Tilbury, 1995). Chapter 36 describes the importance of education to address the environment and development issues and to promote sustainable development. Basic education is needed to connect with environmental issues and it should involve many disciplines such as physical, biological, and social as fundamental for environmental and developmental education. Education in any form, formal and non-formal, is essential to shift the attitudes of people (Sitarz, 1993). It has been argued that new educational forms are needed, since traditional educational forms have not been able to solve environmental issues for people (Rupert, 2000). Sitarz (1993) argued that those forms of education are important to attain the environmental and ethical awareness of values, attitudes and behaviour for successful sustainable development.

Education for sustainability needs people to reflect on their own values and the values that are rooted around them. The decisions they make are based on their values and their responsibility both individually and collectively (PCE, 2004).

#### *Education for sustainability themes*

Skoien (2005) identifies five themes of education for sustainability derived from a number of documents and Education for Sustainability (EFS) literatures, and creates a framework for conceptualizing and understanding a current vision of EFS. These include participation; critical thinking; local relevance; holistic, interdisciplinary and systematic; and value-driven.

##### 1. Participation

Participatory approaches are highly relevant to EFS (p.56). Participation is engaging all stakeholders from government to communities together to participate in decision making. Participation also means willingness to learn through actions.

## 2. Critical thinking

Critical thinking is needed to connect communities in social change and environmental actions.

## 3. Local relevance

Education for sustainability should be implemented at the local level because it will engage local communities to see the environmental problems in their area and build their ability to find solutions for the problems.

## 4. Holistic, interdisciplinary and systematic

According to Fien and Tilbury (2002), holistic highlights the environment as a whole and emphasizes the connectedness between natural and societal aspects. Interdisciplinary means that education for sustainability arises from many disciplines of knowledge. Education for sustainability is stated to be systematic because it focuses on the relationship between nature and life; analyses social, culture and political issues to address sustainability issues (Huckle, 1999).

## 5. Values-driven

Values needed in education for sustainability support compassion, equity, justice, peace, cultural sensitivity, respect for the environment and recognition of the rights of future generations (PCE, 2004)

### ***2.5.3. Environmental education and education for sustainability in Indonesia***

Brauer (2002) wrote a report about the current environmental education situation in Indonesia. The purpose of her study was to analyse the situation of environmental education at both a formal and non-formal level in Indonesia. Some issues have arisen from her study. In previous years, the government did little to formulate environmental education into national policy and the inconsistency and discontinuities in implementing environmental education programs and activities can be seen (Brauer, 2002). However, recently the Indonesian government has realized the importance of environmental issues in

schools. The Ministry of National Education and the State Ministry of the Environment signed the Memorandum of Understanding to improve environmental education values of democratic and responsible citizens. The memorandum proposed to review the current school curriculum orientation to promote understanding of environmental awareness through more positive attitudes toward the environment (Sirait, 2005, cited in Kusmawan et al., 2006).

Local content subjects (culture, language and environmental education) have given opportunities to implement environmental education in school. However, teachers can still choose the subjects that they want to teach in local content since there is no obligation to teach environmental education. The study conducted by Brauer (2002) shows that only a small number of teachers have been implementing environmental education in their classroom since the majority of teachers lack both interest and knowledge in environmental education.

In non-formal education, the majority of environmental education is carried out by Non-Governmental Organizations (NGOs). The methods used to teach environmental education are seminars, workshop, print media and radio (Brauer, 2002). Some NGOs developed environmental education centres in some regions in Indonesia to fulfill the needs of Indonesian people in learning about environmental issues and motivating them to care about the environment through their decision-making in daily life (Fuhker, 2002).

The team from Hanns Seidel Foundation established educational materials in the form of thematic modules for primary schools. These five themes are Water, Air, Biodiversity, Soil and Land, and Education for Sustainable Development. This foundation also conducted training on environmental education and education for sustainable development in many regions in Indonesia (Hanns Seidel Foundation, 2008). It is another NGO which networks with a number of NGOs in Indonesia, working together to implement their objective in improving people's awareness and responsibility for environmental sustainability.

## **2.6. Chapter summary**

This literature review covered four main sections: the conceptual understanding, values and attitudes, marine environment, and sustainability.

According to the literature, concepts become important since they construct the basic unit of meaning and are important in knowledge development. Children are able to identify a particular concept and their understanding develops as they grow up. There are some factors that influence children's learning of a concept such as their experiences, their unique ability and their psychological aspects including the capability for risk-taking, self-efficacy, adaptability and curiosity. Constructivism is a theory of learning that demonstrates how people learn to make sense and make meaning of new knowledge and add into their existing knowledge. A social theory of learning has been developing since people not only construct their knowledge through their mind, but also through their social interactions with other people. This has developed further to become the socio-cultural view of learning acknowledging that people learn and develop their sense and meaning through social interaction between themselves and cultural sources.

Values are normative views about the world which bring particular motivational concerns that people need to deal with their individual, social and social institutional needs. Values, together with norms of belief, influence people's decision to act. The values are important to understand attitudes about environmental issues. People will have positive values after their basic needs have been met. Research studies show that there is strong connection between knowledge, experiences and attitudes toward the environment and people tend to act if the issues are related to them.

The literature review highlights that Indonesia is rich in marine biodiversity. Marine environments, in particular seagrass beds, mangrove forests and coral reefs, have faced degradation due to lack of knowledge in communities.

The review argued that education for sustainability is important because it is not only addresses the need for knowledge for children but also the need to be able to

manage the environment in sustainable ways. Action competence is important in addressing these environmental issues. This study focused on the possible development of knowledge, attitudes and values towards the sustainability of the marine environment in Lombok. The next section looks at how this study was conducted.

## **CHAPTER 3**

### **METHODOLOGY**

#### **3.1. Chapter overview**

This chapter outlines the methodology of this research. It begins with the research questions, followed by a discussion about the methodological framework which guided the research. The next section discusses the research methods used in this research, and the following section is the research design with discussion of the research process, pilot study sample collection, and data analysis. The quality of research and ethical considerations are discussed in the next sections and the chapter closes with a summary.

#### **3.2. Research questions**

According to Mutch (2005), the research questions will influence the research design and illustrate the approach to data collection. This research is designed to investigate children's knowledge and conceptual understanding of their local marine environment and children's ideas about sustainability, and to compare the responses in these areas between children from fishing and non-fishing families in a coastal region. The research questions were:

1. What knowledge and conceptual understanding do primary school students living by the sea in Lombok, Indonesia have about their local marine environment?
2. What ideas do primary school students living by the sea in Lombok, Indonesia have about sustainability in their local marine environment?
3. What differences exist in the knowledge and conceptual understanding and ideas about sustainability in the local marine environment for primary school students living in communities that depend on their local marine environment in different ways?

The research questions guided the appropriate methods for gathering the data that would provide the answers to the questions. The next section discusses the methodological framework that was used in this research.

### **3.3. Methodological Framework**

Denzin and Lincoln (2003) define a paradigm as “a basic set of beliefs that guide action” (p. 245). According to Cohen, Manion and Morrison (2000), a methodological paradigm is a perspective that presents the foundations that guide researchers to conduct their research. In educational research, a paradigm could be the positivist or normative approach, the post-positivist or interpretive approach, or the critical approach (Cohen et al., 2000; Mutch, 2005). As a researcher, it is important to select the paradigm and method that are suitable for what he/she is trying to investigate (Punch, 1998).

This research is investigating the marine conceptual understanding and ideas about sustainability among the children who live close to the marine environment. As the study seeks to understand the children’s interpretation of their world, the interpretivist paradigm was most appropriate as a methodology. According to Creswell (2007), interpretivism (which is sometimes merged with the social constructivism paradigm) is looking at how individuals understand the world where they live and work. However, this approach is not solely seeking the individual’s views, it is more about how their view is formed by interaction with others. One approach in interpretive investigation is qualitative research (Cohen et al, 2000). According to Burns (2000), the qualitative researcher “attempts to gather evidence that will reveal qualities of life reflecting the multiple realities of specific educational settings from participants’ perspectives” (p.388). Qualitative research emphasizes how the meaning of reality is socially constructed (Denzin & Lincoln, 2000; Mutch, 2005). This approach was appropriate for collecting rich data for my research. In addition, quantitative data was collected to examine the spread of responses across the participants.

### **3.4. Research Methods**

In educational research, methods are the procedures to gather the data (Cohen et al., 2000). Cohen et al. (2000) argued that case studies, observations, interviews, questionnaires and action research are methods that can be employed in interpretive research. Questionnaires and interviews were used to gather the data from the participants in this study.

#### ***3.4.1. Questionnaires***

A questionnaire is one method of conducting a survey. A survey aims to gather enough quantitative data to be able to generalize to a population (Mutch, 2005). A questionnaire is used when factual information is desired (Best & Kahn, 1993). A questionnaire can also be used to gather qualitative data. Qualitative or open questions ask the respondents for their ideas, preferences or opinions in narrative or descriptive form and are then analyzed thematically (Mutch, 2005).

Best and Kahn (1993) described a number of characteristics needed to design a good questionnaire. It should be as short as possible so the participants find it easy to complete. The appearance should be attractive, neatly arranged, and clearly duplicated or printed. The content should be clearly and carefully stated. The questions should be objective, with no leading suggestions as to the responses desired and it should be easy to tabulate and interpret.

This research used a questionnaire to investigate primary school children in years 5 and 6 about their experiences, knowledge, values and attitudes toward the marine environment. De Leeuw and Borgers (2004) discussed what the researcher should be aware of in research involving children. They found that children's responses to their questions are influenced by their cognitive, communicative and social skill. Because of this, a questionnaire should be tailored to fit the cognitive, linguistic, and social competence in every age group. The cognitive, communication and social skills of children are also dependent on their heredity, learning, experiences, and socioeconomic factors (de Leeuw & Borgers, 2004). Additionally, de Leeuw and Borgers (2004) highlighted the importance of

language ability among middle childhood (7 to 12 years). The researcher needs to be careful in designing a questionnaire so the children do not face difficulty in completing it. In addition to language ability, the memory and processing time are other important issues.

There are several types of question and response models in questionnaires, which fall into two categories, open and closed questions. Closed questions allow respondents to select from pre-determined categories (Cohen et al. 2000; Krosnick, Judd & Wittenbrink, 2005; Mutch, 2005) for example, dichotomous questions, multiple choice questions, and rating scales (Cohen et al, 2000). Open questions allow respondents to state their responses in their own way (Cohen et al., 2000; Krosnick et al., 2005; Mutch, 2005); however, these responses are difficult to code and classify (Cohen et al, 2000),.

The researcher needs to consider how to design the questionnaire with the purpose to measure the children's attitudes. Closed-ended questions are dominantly used in attitudes measurement. The main reason for using the closed-ended questions is they make it easier to deal with the complexity of coding (Krosnick et al., 2005). The closed-ended questions have disadvantages in the creation of an attitudes rating scale, the *don't know* response is used to deal with reliability and validity. Krosnick et al. (2005) highlighted the problem in using open-ended questions since a number of researchers worried that the participants have difficulty to express their feeling.

A questionnaire was chosen to measure the students' conceptual understanding and ideas about sustainability of their local marine environment. The researcher was interested in discovering their understanding about their environment and about sustainability. The questionnaire was divided into a number of sections. The first section collected the demographic data about the children (age, class, school and their parents' occupation). The second section investigated the experiences that are related to their activities in the beach or sea and their fishing experiences. The third section was about their knowledge of seagrass beds, mangrove forests and coral reefs ecosystems. The researcher provided pictures of each ecosystem containing ten pictures of plants and animals which live in each ecosystem (see

Appendix A). The pictures of seagrass beds, mangrove forests and coral reefs ecosystems were drawn by my colleague. The colleague used the photos provided of plants and animals from these three ecosystems and he drew each ecosystem with its animals and plants similar to real conditions. The questionnaire included questions to examine the values and attitudes of children to these ecosystems. The next section was about what children know about sustainability and the last section was what values and attitudes the children have about sustainability. The majority of questions were closed-ended questions, using nominal measurements by using *yes*, *no* and *don't know* answers to respond to the questions. A small number of open-ended questions were used to allow the children to express their ideas in an open way in writing. The questionnaire was written in Bahasa Indonesia, which is the language of instruction in these schools.

### **3.4.2. Interviews**

The interview is an important data collection method which tends to be used by qualitative researchers (Denzin & Lincoln, 2000). The interview is in a sense an oral questionnaire. People are usually more willing to talk than to write (Best & Kahn, 1993). One major advantage of the interview is its adaptability (Bell, 2005). In addition, when interviewing, the interviewer can explain the investigation's purpose in more detail and just what information he or she wants. If the subject misinterprets the question, the interviewer may follow it with clarifying question (Best & Kahn, 1993).

Cohen and Manion (2000) suggest that research interviews serve three purposes:

1. They are a principal way of gathering information relating to the research objectives;
2. They can be used to test hypotheses; and
3. They can be used to support other methods (e.g., triangulate data or go deeper into elements uncovered by other methods).

Qualitative interviews are generally semi-structured or unstructured, of longer duration, and conducted one-to-one (Denzin & Lincoln, 2000). This research used semi-structured interviews for collecting data. This was because the researcher

wanted a more in-depth understanding of the topic or issue from the participant's perspective.

Denzin and Lincoln (2000) described the general types of interviews; it can be face-to-face or mailed and telephone surveys, and it can be individual or in groups. This research used face-to-face interviews with teachers individually and face-to-face focus group interviews with children and elders. Morgan (1996, cited in Morgan, 2002) defined the focus group interview as "a research technique that collects data through group interaction on a topic determined by the researcher" (p. 141). The purpose of a focus group is to focus discussion on a particular issue (Bell, 2005). In Bell's (2005) experience, focus groups are more likely to include members who have similar characteristics or experiences. Focus groups are undoubtedly valuable when in-depth-information is needed "about how people think about an issue – their reasoning about why things are as they are, why they hold the views they do" (Laws 2003, p.299 cited in Bell, 2005). The advantages of group interviews are that they are generally not expensive and commonly generate rich data and encourage the participants to respond (Denzin & Lincoln, 2000), and participants' interactions can provide precise information since they have to support their arguments to their peers (Eder & Fingerson, 2002). However, a problem that might arise in group interviewing, for example, is that it is possible one member of the group may dominate the interview (Denzin & Lincoln, 2000).

Children are part of this research in which data is gathered from them. De Leeuw and Borgers (2004) identified children as actors in their own right. It is important to obtain information on their opinions, attitudes and behavior directly from them (de Leeuw and Borgers, 2004). Additionally, an interview will allow them to express their own explanation rather than depending on adult explanations (Eder & Fingerson, 2002). Since children construct their knowledge through their interaction with others, it is natural to share the ideas in group settings. Research with children needs to be ethically justified, sensitive to their stages of development, and open to modification of methods, setting and tools (Mutch, 2005).

The interviews which involve children require skills by the interviewer. Beforehand, the researcher introduced herself in the classroom and explained about her research and children were allowed to ask questions. The purpose was to help the children become aware and familiar with the presence of the researcher. A focus group interview can help to generate children's answers because it allows each child to respond to their peers' answers and extend their own ideas. Since the children were not familiar with interviews, the researcher had to be careful to avoid bias. Before the interview, the researcher reminded the children that the interview was not a test and there was no right or wrong answers. The researcher asked each question carefully and asked the children who want to answer first, then asks who want to add or gave other response. The children who not respond would be asked again and the researcher gave time for them to answer if they wished. The administration staff of the school accompanied during interview and assisted children who needed any explanation in their local language. The interviews were conducted in Bahasa Indonesia, which most children could understand, but some required some clarification in their own local language.

### **3.5. Research Design**

This section addresses choosing the sample, the pilot study conducted prior to the main research, the research process and analyzing data.

#### ***3.5.1. Sample of participants***

The researcher needs to select the sample population specifically to make sure that the sample represents the population and so avoid bias in any aspect (Burns, 1994). Blaxter, Hughes and Tight (2001) divided sampling strategies into two main groups: probability and non-probability sampling. In a non-probability sampling, researchers select a particular group that represent themselves. Commonly, the non-probability sampling is found in small scale research (Cohen et al., 2000).

One concept of non-probability sampling is purposeful sampling (Creswell, 2007) and a qualitative researcher purposively and conceptually considers sampling naturally (Huberman & Miles, 1998). The researcher handpicks the participants because they are able to give information that the researchers are trying to examine about the research problem (Cohen et al., 2000; Creswell, 2007).

#### *Selection of school*

There were a number of considerations in selecting the sample for my research. Two schools have been selected to participate in this research. These schools are government schools, which are located in the coastal region in East Lombok Regency. The selections were based on my work in those schools that is already familiar in the region and as representatives of villages in the region that had appropriate schools for the study aims. It is also easier to deal with local government with the schools in the same region, rather than across regions.

#### *Selection of students and teacher*

The students were chosen from fifth and sixth grade classes with the range of ages ten to twelve years, and comprising both male and female. The questionnaires involved the whole class and selected students then participated in interview sessions. One random group of children from fishing families and one random group from non-fishing families' background were selected for separate focus group interviews in each school. Each focus group consisted of 4 children. The teachers of each fifth and sixth grade class in each school were invited to participate in an individual interview.

#### *Selection of community participants*

The elders from the two villages were selected to participate in this research. The elders were chosen based on their role in the village such as head of village, business people, etc. There was a focus group from each village consisting of 3 elders.

### **3.5.2. Process**

#### *3.5.2.1 Pilot study*

This small-scale interpretive research is divided into two parts. The first part was a pilot study. According to Blaxter *et al.* (2001), a pilot study is the process of testing the research technique and method, finding out how it works and making any revisions needed. Bell (2005) points out the purpose of a pilot study are to clear out any unnecessary items so the participants in the main research will not find any difficulties in completing it. Also, by doing a pilot study, the researcher becomes aware of the ambiguities in the wording, inconsistency of the questions and the length of time it takes to complete, and this allows the researcher to do an initial analysis to discover if there are stumbling blocks in any question format when it is analyzed. The pilot study is carried out in a location which has similar conditions to the main research.

The pilot study involved two schools not involved in the main research with 10 year 5 and 6 children in each school. The children were chosen randomly. I also asked for comments on the questions from the teachers to ensure the children would understand them. De Leeuw and Borgers (2004) advised pre-testing the questionnaire to discover the difficulties that might children face in certain age groups.

The purpose of the pilot study is to examine if there any issues that will influence the questionnaire design. The pilot study resulted in no major change, just the instruction to students to circle their answers rather than cross them, as the children were more familiar with this style.

#### *3.5.2.2. The procedures*

Mutch (2005) highlighted two aspects in approaching the participants, *practical* and *ethical*. In the practical aspect, initial contact and follow up contact were important for this research.

### *Initial contact*

The participants in Lombok Island, Indonesia were contacted personally by my colleagues on my behalf. My colleague gave a general explanation of the research and made appointment times to meet.

### *Follow-up contact*

After arriving in Lombok, my colleague and I met the schools' principals to discuss the research in detail, and asked them to give formal permission by signing a consent form including the confirmation of dates and venues. The teachers from year 5 and 6 also met with me to discuss the research process and the selection of participants for group interviews. I did not ask the permission from the parents for their children's involvement in the study since this was not common in Lombok and it was hard to gain the consent from them due to time constraints.

#### *3.5.2.2. Questionnaire process*

My colleague and I distributed the questionnaire to children from year 5 and 6 in two schools in coastal regions of Lombok. Teachers were not present during the questionnaire process. My colleague assisted me to translate the questions into local language if some students did not understand Bahasa Indonesia.

#### *3.5.2.3. Interview process*

To get information in depth, I also conducted interviews with students, teachers, and adults who have a strong influence in these two communities, such as head of the village and elders. For the focus group interview with the students, I asked the teacher to select four students randomly with a gender balance and representing each grade. The interviews were semi-structured with 23 questions and conducted in Indonesian language (Bahasa Indonesia) (see Appendix B & C). The interview took no more than one hour and was conducted in the classroom. The community interview was also a focus group with three people representing the elders in each

coastal community. They were asked 27 questions and it took no more than one hour. The adult interview had the purpose of collecting information that might be useful in describing the coastal environment condition. The interview was conducted in Indonesian language (Bahasa Indonesia) (see Appendix E). The interview was conducted in the place based on their decision. Where children were not familiar with Bahasa Indonesia, an interpreter (not the teacher) was there to assist to explain. Although it is possible that the questions and children's responses were misinterpreted due to language issues, these were minimized as much as possible.

The teacher interviews were conducted individually. They were semi-structured interviews with 21 questions and took about one hour to complete. The interview was conducted in Indonesian language (Bahasa Indonesia) (see Appendix D). The children and teacher's interviews were conducted in the teacher's room. Some problems occurred when the other students who were not involved in the interview were standing outside the room and watching their friends who were being interviewed, and made many comments. The teachers tried to ask the children to be quiet but sometimes it was not helpful.

Elders' interviews were held in the venue based on their decision. There was some difficulty to convince one focus group to be interviewed since they had had a bad experience when another party tried to gain information about their fishing activities. But eventually they agreed when given full information about the purpose of the study.

All interviews were tape-recorded and I also made some notes during interviews.

#### ***3.3.4. Data Analysis***

Generally, raw qualitative data are in text format taken from original texts such as policy documents (Mutch, 2005) and from questionnaires and interviews (Bell, 2005; Best & Kahn, 1993; Mutch, 2005).

In qualitative research, thematic analysis is the common approach in text analysis (Mutch, 2005). Best and Kahn (1993) describe some stages in analyzing qualitative research. After raw data gathering from a particular method, the data will be *organized* into categories, depending on the research purpose, the number of participants, settings and/or times. This is followed by *description*, in which the researcher describes the relevant components of research such as settings, the viewpoints of participants, etc.

### *Questionnaire analysis*

Since the participant numbers were small, I did not use complex statistical analysis. I used descriptive statistics to show the characteristics of data collected from the research. This allows the full description of the research. After data have been collected, five theme categories were created that corresponded to the research themes, and the questionnaire answers were coded and put into these categories. The next step was coding and analysis of each category of data. The code is given to words or sentences with similar meaning, and will help the researcher to recognize the themes and focus on these important attributes (Burns, 2000; Mutch, 2005). The data which had been coded were transferred to Excel spreadsheets determined by theme categories. The spreadsheets supplied the information about themes, number of children and the percentage. The information was classified between children from fishing families and children from non-fishing families. The data was presented in tables to summarize data and bar graphs to make comparisons between variables (Mutch, 2005). The analysis was given peer debriefing to check the answers did not fall into the wrong categories.

### *Interview analysis*

The audio-taped interviews were transcribed and added to notes taken during the interview sessions. The notes were important because they provide more information and important things from the participants (Cohen et al., 2000). I transcribed the interview in Bahasa Indonesia and translated into English. As with the questionnaire data, interview data were coded to look at the themes and

patterns and was categorized into five themes which also met the themes from the questionnaire data. The interview data supported and clarified the questionnaire data.

### **3.6. Quality of research**

#### ***3.6.1. Validity and Reliability***

Validity and reliability are important for the process of collecting the data to be successful (Best & Kahn, 1993, Cohen et al., 2000).

“Validity means that your study actually measures what it sets out to measure” (Mutch, 2005, p.114). To assist validity, the researcher definitely should be clear about and define the terms, variables, attributes and units of analysis (Mutch, 2005).

There are various types of validity. The two main types are internal and external validity. According to Cohen et al. (2000), internal validity is that the research findings are supported by the data. However, sometimes participants create inconsistency because they respond with what they think the researcher will expect to hear, tell lies, misinterpret or not respond to questions. To enhance the credibility of the data collection, triangulation of questionnaire data with interview data and classroom/community observation, peer debriefing with supervisors and negative case analysis were all used. External validity is concerned that the result of the research can be generalized (Cohen et al., 2000). As this study involved a specific case of two coastal schools and their communities in Lombok, the generalizability of the findings is limited. However, by providing a clear description of the setting, participants and research process it is hoped that a clear picture of the circumstances for the study is given to enable readers to translate findings into their own context. In this study, participants did not wish to validate transcripts of their interviews, believing that they could trust the researcher to transcribe accurately. In addition, logistical difficulties of working in remote communities would have made this process challenging. This is then a limitation in this study. In addition, as the interview transcripts were translated from Bahasa

Indonesia into English, by a native Bahasa speaker, there are possibilities that ideas expressed by the interviewees were mis-translated and this is again a potential limitation in the study.

Cohen et al. (2000) stated that in qualitative research, the participants' characteristics, attitudes and views and opinions might be a bias factor. To minimize this bias, the researcher should deal with honesty and openness with the participant. To make sure of the validity, the researcher collected adequate data, used open-ended questions to produce in-depth data and then presented findings to readers so they are able to extend them to other contexts.

“Reliability means that you or someone else could replicate your study with similar results” (Mutch, 2005, p.114). Cohen et al. (2000) argue replication in qualitative research means it is hard to repeat the research position, the selection of participants, social setting, the premises and the analysis. The level of accuracy and comprehensiveness is ensured by a clear explanation of how the research was conducted and how the findings were managed. In this study, a clear description of the research process has been provided to give a pathway to the data collection and analysis. In addition, triangulation of data sources and collection methods has assisted with reliability.

### ***3.6.2. Ethical Issues***

Any research that is dealing with human beings should apply ethical considerations to protect the researchers and the participants of the research from potential harm (Cohen et al., 2000).

The researcher confirms that this research always followed the ethical process and procedures correctly. Since this research is under higher education institutions, I have followed the codes of ethics and ethical approval systems for the research under their auspices (Mutch, 2005).

I sent an application to the Centre for Science and Technology Education Ethics Committee, University of Waikato, explaining my research topic, aims and

objectives, justification of my research and outlining some ethical issues which might occur in my research and how to deal with them.

There are some generally accepted notions in research ethics which are discussed below.

### *Informed consent*

The participants of any research should be as completely informed about the research as possible and give their consent to be participants (Mutch, 2005). My colleague visited the schools and met the principals in advance to explain my plan and gained permission to conduct the research in their schools. The elders in the villages were also contacted and asked about their willingness to participate in the research. Then I visited the school and met the principal and had further discussions. The teachers of years 5 and 6 were also contacted and the principal outlined my research and I arranged a time that was suitable for them to conduct the research in their classroom. The principal and the teachers signed the consent form.

When children are not competent to give informed consent due to age, their guardians or responsible agents should be consulted (Best & Kahn, 1993). In Lombok Island, in particular in the village or remote area where surveys or research have mostly never occurred, it is difficult to collect a consent form from the parent of the children who are part of the study. After discussing this with my supervisor, I only asked the permission from the principals and their class teacher for access to the students.

### *Voluntary participation*

Participants freely chose their participation in this research (Best & Kahn, 1993). I asked the children who willing to volunteer to be interviewed. If I had asked the teacher to pick the children, they could feel that they have to obey the teacher and it is compulsory for them. I reminded the elders that their participation was voluntary and they have a free choice of whether or not to participate.

### *Confidentiality*

The data from the research was stored in a secure place. I kept the data that was collected from the participants in strict confidence, concealing the participant's identity in all accounts and information (Best & Kahn, 1993). The participants' identity is anonymous and the researcher has given them a pseudonym to identify them in the thesis. Only the researcher and her supervisor are able to access the research data.

### **3.7. Chapter Summary**

This chapter provides an overview of the methodology underpinning my research. The research questions guiding the research are outlined. This research used the interpretivist paradigm since the purpose of the research sought to understand what conceptual understanding that children hold about their local marine environment. A qualitative research approach was used for collecting data. The research design outlined how to select the participants, the process and how data was analyzed. The data was collected through a questionnaire for primary school children years 5 and 6 and an open-ended interview for focus groups of selected children and elders in their villages, and individual interviews for the teachers. A pilot study had been conducted to identify any issues that might influence the data collection by the questionnaire. The validity, reliability and any ethical issues were described in this research. The next chapter deals with presentation of data and findings.

## CHAPTER 4

### FINDINGS

#### 4.1. Chapter Overview

The findings of this study are presented in three main sections. The first is the demographic information of the participants who responded to the questionnaire and interview. The second section presents the findings in five theme categories relating to the research questions: experiences, knowledge of marine ecosystems, marine values and attitude, sustainability knowledge and sustainability values and attitudes. Each element is presented separately with supporting tables and quotes from the participants. The third section is a summary the findings.

#### 4.2. Demographic of participants

Seventy four children from two schools located in the coastal regions in Lombok Island, Indonesia, participated in completing a questionnaire in this study. Table 2 presents the school children characteristics. The number of children was not balanced between the two schools because the number of children attending Thalasso Primary School is smaller than for Pelago Primary School (note: school names are pseudonyms). As such any comparisons drawn between the data from the two schools are very tentative.

Table 1 School children characteristics

	Pelago Primary School (n=50)	Thalasso Primary School (n=24)	Total
<b>Gender</b>			
Male	22	9	31
Female	28	15	43
<b>Age</b>			
9 - 10 years old	7	0	7
13 - 14 years old	41	21	62
14 - 15 years old	2	3	5
<b>Parent occupation</b>			
Fisherman	12	17	29
Farmer	34	7	41
Other	4	0	4

From the survey participants, four focus groups of four children were convened in each school. The focus group participants were selected randomly with a balance of males and females from cohorts according to grade level and family livelihood, being fishing or non-fishing. In other words, the four groups interviewed in each school were:

- Grade 5 children from fishing families
- Grade 5 children from non-fishing families
- Grade 6 children from fishing families
- Grade 6 children from non-fishing families

Two teachers from each school, one who taught grade 5 and one who taught grade 6 were interviewed individually. Table 3 presents the school teachers' characteristics.

Table 2 School teacher's characteristics

Name of teacher <sup>2</sup>	Gender	Age	School	Qualification	Subjects	Experience
Paras	M	27	Pelago	DipT-Primary	Bahasa Indonesia, Math and PPKn <sup>1</sup>	4 years
Padma	F	43	Pelago	DipT-Primary	All subjects	23 years
Taranga	M	45	Thalasso	BTchg	All subjects, except Religion and Sports	25 years
Triya	F	25	Thalasso	DipT-Primary	All subjects	1 years

An elder focus group was held in each of the two villages where the schools are located, each group comprising 3 elders. This was their preference rather than being individually interviewed. All were fishermen and one of them a free-diver for sea cucumber. They were male and between 31-48 years old. All of their families were originally from South Sulawesi, which lies to the north of Lombok and their great grandparents had migrated from South Sulawesi to Lombok long time ago. They were able to speak two languages; Makassar or Bugis from South Sulawesi and Sasak or local language and Bahasa Indonesia (Indonesian language) as well. Two of them had migrated from Sumbawa Island, which lies to the east of Lombok.

<sup>2</sup> The names used are pseudonyms for the teachers

### 4.3. Experience and knowledge of, and attitudes towards, the marine environment

This section presents the findings related to the research questions. Data were collected on participants' general experiences, knowledge and attitudes in the marine environment, and more particularly in three key marine environments important in Lombok: seagrass beds, mangrove forests and coral reefs.

#### 4.3.1 Experiences

In the survey and interviews, children and elders were asked a number of questions about their experiences in relationship to the beach or the sea. The questions to the children were to discover how their experiences may have shaped their knowledge about the marine environment. The questions to the elders examined how their experiences had shaped their understanding of the marine environment, and sought to identify their possible influence in shaping children's values and attitudes towards the marine environment.

##### 4.3.1.1. Experience in the coastal environment

The study examined the experiences of children and elders in their coastal environment. The survey of the children asked them how often they visited the beach or the sea and what activities they did there.

Table 3 Children activities in the beach or the sea

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>I go to the beach or the sea ...</b>					
Everyday	23	79%	14	31%	50%
3 or 5 times a week	2	7%	8	17%	13%
Once a week	4	14%	18	40%	30%
Never	0	0%	5	12%	7%
<b>I like swimming in the sea</b>					
Yes	25	86%	32	71%	77%
No	4	14%	13	29%	23%

I collect shellfish because ...					
It's fun	15	52%	32	71%	63%
To eat	7	24	5	11%	16%
To get some money	7	24%	8	18%	21%

Table 4 shows that almost all children visit the beach or the sea at least once a week, although the frequencies are different between children from fishing families and non-fishing families. Children from fishing families go to the beach dominantly everyday (79%) while children from non-fishing families go to the beach or the sea less often. Children from non-fishing families may go to the sea only on non-school days, as one such child explained, “I go to the sea every Sunday or school holiday” (Sn5b). This data shows that most children have regular experiences at the beach or the sea, with only 7% responding that they never went there.

Children have different activities while they are visiting the beach or the sea. Children from fishing families have a certain purpose as one child responded from interview “I go fishing with my father and his friends” (Sf5a<sup>3</sup>) or helping their parent as one child stated “Because my parents have floating cage, I help them to feed the shrimps at our floating cage” (Af6a). Children from non-fishing families have various activities while they are at the beach, as one child said “I go fishing” (An5a) or “Just swimming and playing with my friends” (Sn6a and An6a<sup>4</sup>). Playing, swimming and collecting seashells are common activities that children do in these coastal villages. The data from the survey showed that most of children from fishing and non-fishing family like swimming. While swimming, they collect seashells from the sea and the beach for some traditional games. The purpose of this was mainly for fun, as one participant described, “I like swimming with my friends. We also like collecting the shells. We collect the shells for playing” (Sf6c). There was some evidence in the data that children from fishing families also collect shellfish for money or to eat, more so than children from non-fishing families.

<sup>3</sup> S for village code; f for children from fishing families code; 5 for grade in school

<sup>4</sup> A for village code; n for children from non-fishing families; 6 for grade in school

#### 4.3.1.2. Fishing activities in the villages

Fishing is the one of the main activities of children and the elders in the coastal villages. The survey asked the children about their experiences with fishing activities. The elders were also interviewed about their experiences, and their relationship with children's experiences.

Table 4 Children and their fishing activities

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>I go fishing in the sea</b>					
Yes	23	79%	24	53%	63%
No	6	21%	21	47%	37%
<b>If you go fishing, why do you do this?</b>					
For fun	2	9%	8	33%	21%
To catch fish to eat	15	65%	8	33%	49%
To catch fish to sell for money	6	26%	8	33%	30%
<b>If you go fishing, who has taught you how to do this?</b>					
Parents	19	83%	15	62%	73%
Other family members	0	0%	3	12%	6%
Other fishermen	1	4%	1	4%	4%
Friends	2	9%	0	0%	4%
Nobody	1	4%	5	22%	13%
<b>If you go fishing, what methods do you use?</b>					
Lines	21	90%	24	100%	96%
Nets	1	5%	0	0%	2%
Bombing	0	0%	0	0%	0%
Cyanide	1	5%	0	0%	2%
<b>If you go fishing, where do you go?</b>					
Seagrass beds	4	17%	2	8%	13%
Coral reefs	9	40%	7	29%	34%
Fishing platform	0	0%	8	34%	17%
Open sea	10	43%	7	29%	36%

Overall almost two thirds (63%) of children participants went fishing in the sea. Not surprisingly, children from fishing families appeared more likely to go fishing than children from non-fishing families. Nearly one half of the children (49%) from fishing and non-fishing families fished for eating. For fishing family

children consumption is the main purpose for children for fishing families followed by economic reasons (selling the fish) and only 9% has a pleasure purpose while children from non-fishing families have variation between consuming, economically and pleasure purpose. Children from fishing families are more likely to catch fish to eat, whereas children from non-fishing families appeared equally likely to catch fish to eat, to sell for money, or just for fun.

Nearly all students had been taught to fish by their parents. Commonly, people in fishing villages have skill to catch fish even if they are not fishermen. This is because some fishing gear is easy to use. It is not surprising that children from non-fishing families are taught fishing by their parents as well because their parents have the ability to do so.

Fishing gear is important for fishermen. They have different gear that is appropriate for specific fish target. One fisherman stated “We use lines for catching the squids” (Se2). His friend expressed “We use line for catching fishes, *rakah*<sup>5</sup> for catching squids and nets for catching anchovies. We take all fishing gears when we go to the sea” (Ae3). Another fisherman added that the season has an influence on the type of fishing gear they use. He said “the fishing gears we use are depending on season. Now is the squid season so we use nets to catch the squids. On dry season, we catch tuna and Spanish mackerel so we use lines. Different season, different catch” (Ae1). Table 5 shows that nearly all children used lines as their fishing gear, only one child from fishing families used nets. One child from a fishing family was able to distinguish fishing gear for specific target fish “Lines for catching tuna fish and nets for catching the anchovies” (Sf5a). Fishing using lines is easy and this is reason why children from non-fishing family learn by themselves (22%). It is interesting that one child from a fishing family reported using cyanide. Using destructive fishing methods to catch fish such as dynamite and cyanide are common in some fishing villages in Lombok Island. However, these practices were banned about ten years ago in these villages.

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<sup>5</sup> *Rakah* is traditional fishing gear made from bamboo

Fishing location determines where fishermen want to go. Fishermen who own a boat with an engine will go far from the village while fishermen who only own small boats will fish close to their village. Some fishermen comments were “I use small boat and only fishing around the coast due to the size of my boat (Se1); “We only catch in inner bay due to our boat and fishing gears” (Ae3); “We catch tuna and jackfish in inner bay. We catch damselfish in outer bay” (Ae2). Children were asked in the survey about where they experienced fishing. Children from fishing families reported going fishing predominantly to coral reefs (40%) and the open sea (43%) whereas children from non-fishing families appeared less likely to fish in these locations (29%) and also went to fishing platforms (34%). This may be because children from fishing families are more likely to have a boat to go to coral reefs and open sea, while children from non-fishermen families may not. One child from fishing families responded “We go fishing to Gili Sepia<sup>6</sup>” (Sf5a). Fishing platforms can be reached without using a boat. The next section examines further the experiences of children in three important marine environments.

#### *4.3.1.3 Children’s experience visiting the seagrass beds, mangrove forests and coral reefs*

These two villages have seagrass beds, mangrove forests and coral reefs ecosystems close to them. Children were asked about their experience visiting those three ecosystems. Their experience may influence their knowledge about seagrass beds, mangrove forests and coral reefs.

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<sup>6</sup> Gili Sepia (anonymous) is an island located in front of Pelago village surrounded by coral reefs

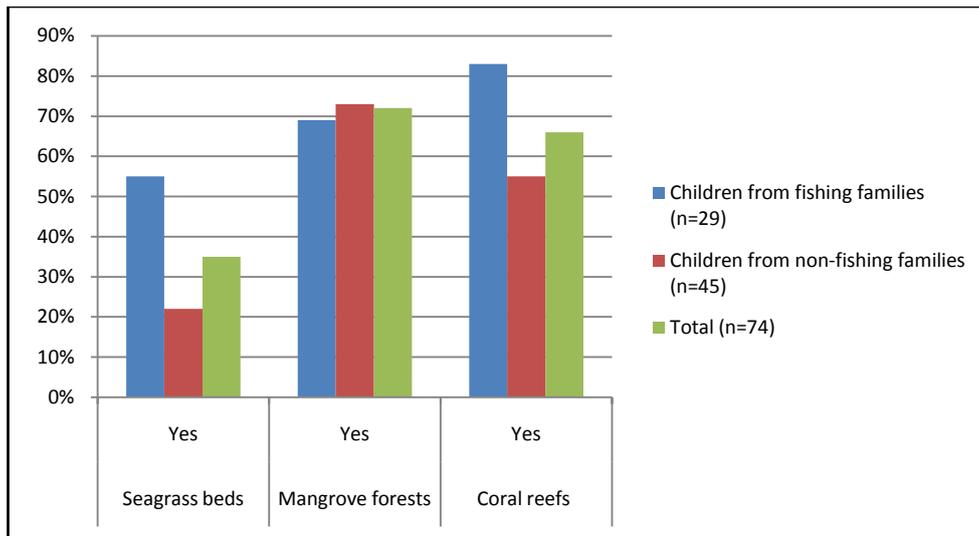


Figure 3 Percentage of children who reported visiting seagrass beds, mangrove forests and coral reefs

Figure 3 shows that mangrove forests are the ecosystem which most children from both fishing and non-fishing families have visited. The percentage of children who visited mangrove forests was very similar between children from fishing families and non-fishing families. This may be due to easy access to mangrove forests because they are near the shore and do not need transportation such as a boat. The percentage of children from fishing families who visited coral reefs and seagrass beds were higher than that of children from non-fishing families. Children from fishing families visiting coral reefs more frequently may be linked to their fishing activity in coral reefs (see Table 5). In the survey of their experiences, the seagrass beds were the places that children visited least.

#### 4.3.1.4 Summary of experience

Almost all children from fishing and non-fishing families visit the beach regularly although the frequencies were different. Children from fishing families have fishing-related activities while at the beach or the sea, and children from non-fishing families mostly tend to have pleasure activities. Nearly half the children from fishing and non-fishing families go fishing and for fishing gear they use mainly lines. One child from a fishing family reported using cyanide which is banned nowadays. Boats are essential for fishing activities in the open sea.

Children from fishing families tend to go to coral reefs and open sea while children from non-fishing families go fishing close to the beach.

Mangrove forests are the ecosystem which children from fishing and non-fishing families visited most. This is due to easy access to mangrove forests. Children from fishing families visited coral reefs most frequently due to their fishing activities. Seagrass beds are the ecosystem which is least visited by children. These experiences may be important in determining children's knowledge of the marine environment.

#### ***4.3.2. Knowledge of marine ecosystems***

This section presents findings about children's knowledge of the three marine ecosystems of seagrass beds, mangrove forests and coral reefs. These findings were collected from the questionnaire and focus group interviews.

##### ***4.3.2.1. Knowledge of seagrass beds***

Seagrass beds are an ecosystem in the coastal region; however, only small numbers of people are aware of them and pay attention to them. This research is seeking to examine what children know one of their local marine environments and what they understand about seagrass beds. Data was also gathered from the village elders and the school teachers regarding their knowledge of seagrass beds.

In the questionnaire, children were given a picture of a seagrass community containing ten animals and plants commonly found there (see Appendix A) and asked to identify as many as they could. Other questions looked at conceptions that children hold about seagrass bed ecosystems. In addition, children and elders had been interviewed to get better understanding of their knowledge and experience in the seagrass beds.

Table 5 Children's knowledge about seagrass beds ecosystem

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>Can you identify...? (Pictures of 10 plants and animals provided)</b>					
< 4	0	0%	11	24%	15%
4 – 7	11	38%	28	62%	53%
> 7	18	62%	6	14%	32%
<b>Seagrass beds are only found in Lombok</b>					
Yes	14	48%	17	38%	42%
No	9	31%	14	31%	31%
I don't know	6	21%	14	31%	27%
<b>Seagrass has roots, stems, leaves, flowers and fruits</b>					
Yes	18	55%	16	35%	46%
No	6	27%	11	24%	23%
I don't know	5	18%	18	41%	31%

Table 6 shows that 85% of all children surveyed were able to identify at least four plants or animals in seagrass ecosystems, but only one third could identify more than seven. There appeared to be a difference in ability to identify members of the seagrass ecosystems between children from fishing families and non-fishing families, with the former scoring more highly.

Nearly 50% of all children surveyed responded that seagrass beds are only found in Lombok, and a further 27% of children stated that they didn't know. This shows that their knowledge about seagrass bed occurrence is limited. In the focus groups, one child from a fishing family identified seagrass beds in terms of its location in the environment, "Seagrass beds are near the land" (Sf6a). It indicates that the child knew about the presence of seagrass beds ecosystem. There did not appear to be a difference between children from fishing families and non-fishing families in their knowledge of seagrass bed occurrence.

Forty six percent of children from fishing and non-fishing families agreed that seagrass has roots, stems, leaves, flowers and fruits. Twenty three percent of them were not agreed. It might be because they knew some part of seagrass but not sure

about the others such as flower and fruits. Children from fishing families were more likely to agree than children from non-fishing families. One fisherman was able to describe what the seagrass was “Based on my knowledge, seagrass is grass which live in the sea. Like grass in the land, seagrass has roots, flower and fruits. The seagrass is flowering and fruiting seasonally” (Se1).

Table 6 What children know about the importance of seagrass beds to others

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>I think seagrass is important for other animals</b>					
Yes	17	59%	23	51%	54%
No	7	24%	9	20%	22%
I don't know	5	17%	13	29%	24%
<b>Who eats seagrass?</b>					
People	9	31%	13	29%	30%
Green turtle	10	34%	10	22%	27%
Starfish	5	17%	14	31%	26%
Shark	2	7%	2	4%	5%
Dugong	3	11%	4	10%	9%
No answer	0	0%	2	4%	3%

About half (54%) of all children surveyed agreed that seagrass beds are important for other animal. There did not appear to be any difference in this view between children from fishing or non-fishing families. One child from fishing families recognized seagrass beds based on the animals which live in seagrass beds “We can find fishes, crabs and sea turtle in seagrass beds” (Af6b). It shows that this child was aware about particular animals that live in seagrass beds and depend on their lives in this ecosystem.

The question about consumers of seagrass was asked as well. This was to look at the concept that the children held. The highest percentage of children from fishing and non-fishing families answered the people (30%) followed by green turtle (27%). People consume the fruit of seagrass not the seagrass itself and only particular seagrass fruit can be consumed. The reason the majority of children chose people might be due to a concept that children associate seagrass with seaweed, which is common to consume. Twenty six percent of children answered

starfish as eating seagrass. Even though starfish live in seagrass beds, starfish are not eating seagrass. Children might have thought that every animal which lives in this ecosystem consumes seagrass. The majority who held this concept were children from non-fishing families. Although the Dugong is the main consumer of seagrass, only 9% children were able to answer this correctly. This may be because the Dugong is not present in Lombok water. Children who have known this may have got their knowledge from other resources, for example their parents, teachers or media.

The teachers were also asked the questions about seagrass beds to look at their knowledge about this ecosystem. Three teachers answered they do not know about them due to their originally not being from a coastal region, for example one teacher responded “I don’t know since I am not from coastal village” (Taranga). One teacher stated what he knew about the seagrass beds, “I see that seagrass beds are still in good condition” (Paras). His statement shows that his knowledge of seagrass ecosystems is limited, as the beds are not in good condition in this area. Elders have various answers about seagrass beds. Two fishermen commented about the seagrass beds based on its function “Seagrass beds are the place to protect the fish” (Se2), “Seagrass beds only have limited function as seahorse protection” (Ae2). The word ‘only’ seemed to reflect that not many people pay attention to seagrass beds ecosystem.

An open question was asked about the seagrass beds ecosystem to allow children to express their ideas.

Table 7 Do children know what can harm seagrass beds?

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>If you know of any things that can harm seagrass beds, please write them in the box below:</b>					
People took and destroyed	2	7%	0	0%	3%
Using dynamite	0	0%	1	2%	1%
Using cyanide	0	0%	0	0%	0%

Using dynamite and cyanide	2	7%	4	9%	8%
Throw rubbish in the seagrass beds	0	0%	1	2%	1%
Human	0	0%	1	2%	1%
No answer	25	86%	38	85%	86%

Table 8 shows the majority of children were not able to answer and only small numbers of children were able to respond the things that can harm seagrass beds.

In the interview, children were asked about the impact if seagrass bed ecosystems were destroyed. Only one child was able to answer “It can cause floods and arise the wave” (Sf5b) while others students said that they did not know. From the literature, it illustrates that the destruction of marine ecosystem including seagrass beds can occur as a result from natural disasters and human activities. Some children were only able to answer the destruction that was caused by human activities and they have a lack of knowledge that natural disaster could cause destruction in seagrass beds ecosystem.

### *Summary*

Children in these villages have some knowledge about seagrass ecosystems. For many children there appear to be significant misconceptions or lack of knowledge about what plants and animals live in seagrass communities, the location of seagrass beds, and the animals that depend on seagrass. Some children hold concepts that were not right about the ecology of seagrass such as the presence of seagrass beds in term of its locations and the consumers of seagrass, seagrass associated with seaweed that people can consume and animals which consume seagrass. Most of the children agreed that seagrass beds are important for other animals and it was also shown from their interviews. Only a small number of children from fishing and non-fishing families identified the things that can harm the seagrass beds and its impact. Children have lack of knowledge that natural disasters also can cause destruction in seagrass beds. There was some evidence that children from fishing families had more knowledge about seagrass beds, possibly due to their greater experience of this ecosystem (see Section 4.3.1.3). Teachers interviewed showed a lack of knowledge of seagrass beds ecosystem,

which they explained as a lack of experience of those ecosystems. On the other hand fisherman showed some knowledge of seagrass beds due to their experience working around them.

#### 4.3.2.2. Knowledge of mangrove forests

Mangrove forests are one of coastal ecosystems important for communities who live along the coastal region. This research is trying to identify what children know about mangrove forests based on their experiences in this ecosystem.

As for the seagrass beds ecosystem, children were given a picture of a mangrove forest community presenting ten animals and plants that are normally found in there (see Appendix A) and asked to identify as many as they could. Other questions looked at the importance of mangrove forests and any conceptions that children held about this ecosystem. Interviews were conducted to gain information from children, teachers and elders about their views of the mangrove forest

Table 8 What children know about mangrove forests and their function for the environment

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>Can you identify...? (Pictures of 10 plants and animals provided)</b>					
< 4	0	0%	2	4%	3%
4 – 7	6	21%	15	33%	28%
> 7	23	79%	28	63%	69%
<b>Mangrove forests are only found in Lombok</b>					
Yes	13	45%	18	40%	41%
No	9	31%	12	26%	28%
I don't know	7	24%	15	34%	31%
<b>Mangrove forests protect lands and islands from tsunamis</b>					
Yes	21	76%	31	64%	70%
No	4	12%	4	9%	11%
I don't know	4	12%	10	22%	19%

Nearly 70% of children from fishing and non-fishing families were able to identify more than seven correct answers about the mangrove community. The highest percentage was held by children from fishing families. Generally children from fishing and non-fishing families have been mistaken in identifying mudskipper. Most of them identified the mudskipper as a chameleon.

Like seagrass beds, children lack knowledge of mangrove forests occurrence. It can be seen from Table 9 that most children responded that mangrove forests are only found in Lombok or that they didn't know. One child from a fishing family mentioned about mangrove forests location "Mangrove forests are in Gili Sepia" (Sf6b).

Both children from fishing and non-fishing family were agreed (70%) that mangrove forests protect lands and island from tsunamis. It is interesting that the children knew about the importance of mangroves to protect land against tsunamis. This may be due to Indonesia's experience of being hit by tsunamis in 2004. Elders also knew that mangrove forests have a function to protect the land, "Mangrove forests have function to protect coastal region" (Se2); "The mangrove forests have function to protect the land from abrasion and wave" (Ae1); and, "Mangrove forests have main function to protect us from abrasion" (Ae3). One fisherman explained about taking the seeds for re-planting the mangrove tree "We only take fruits from mangrove forests. We use it for re-planting" (Se2).

One teacher described the condition of the mangrove forest, "I see mangrove forests that have been destroyed" (Paras). Others teachers answered that they did not know anything about mangrove forests because they are not from the coastal region.

Table 9 Children's knowledge about the importance of mangrove forests ecosystem to others

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>I think mangrove forests are important for other animals</b>					
Yes	18	62%	29	64%	64%
No	6	21%	4	9%	13%
I don't know	5	17%	12	27%	23%
<b>Mangrove forest is a nursery area for some animals, such as fish</b>					
Yes	19	66%	28	62%	64%
No	5	17%	3	7%	11%
I don't know	5	17%	14	31%	25%
<b>Who finds food in mangrove forests?</b>					
Birds	15	52%	23	51%	51%
Green turtles	4	14%	4	9%	11%
Tuna fish	1	3%	6	13%	9%
Bat	6	21%	10	23%	22%
Dolphin	1	3%	1	2%	3%
No answer	2	7%	1	2%	4%

Sixty four percent of children agreed that mangrove forests are important for other animals. From the interviews, children explained about what they see in mangrove forests. It reflected that they were aware that mangrove forests have meaning for animals. One child from fishing families commented “We can find birds, bats, snakes and fishes in the mangrove forests” (Af6b). Another child from fishing families described “We can find pelican, crabs and shrimps which find the food in mangrove forests” (Sf5a). One child from non-fishing families illustrated “There are crabs, shrimps, fish and shells in mangrove forests” (Sn5a). Most of the children mentioned birds are one of the animals that they can saw in mangrove forests. This may have a relationship with the question about animals who find food in mangrove forests. It showed that the highest percentage of children (51%) from fishing and non-fishing families answered bird. Mangrove forests are habitat for some birds. Children who have visited mangrove forests would see some birds’ species. Twenty two percent of children answered bat as animals who find food in mangrove forest. Some children from fishing and non-fishing families

hold misconceptions about some animal such as tuna and dolphin which actually do not find foods in mangrove forests.

Sixty four percent of children agreed that mangrove forests are a nursery area for some animals such as fish. It might be due to their observation in mangrove forests that they might find small fishes around mangrove forests.

An open question was asked about mangrove forests ecosystem to allow children to express their ideas.

Table 10 Do children know what can harm mangrove forests?

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>If you know of any things that can harm mangrove forests, please write them in the box below:</b>					
Cutting down the mangrove trees	4	13%	8	18%	16%
Human	1	3%	1	3%	3%
No answer	24	84%	36	79%	81%

The majority of children from fishing and non-fishing families were not able to identify any things that can harm mangrove forests. Small numbers of children (16%) understand that cutting down the mangrove trees can harm mangrove forests. In fact, mangrove trees are cut down in large numbers.

In the interviews, children were asked about the impact if the mangrove forests ecosystem was destroyed. No children from fishing or non-fishing families were able to answer the question.

*Summary*

Approximately two thirds of children from fishing and non-fishing families showed good knowledge of plants and animals in the mangrove ecosystem. Children and elders agreed that mangrove forests have a function to protect the land from tsunamis, as illustrated by the Indonesia experience of tsunamis in 2004. Birds are one animal that was recognized by children that finds food in

mangrove forests. Children from fishing and non-fishing families have a lack of knowledge of the things that can destroy the mangrove forests. Similar with the seagrass beds, teachers lack knowledge of this ecosystem through lack of experience. There appeared to be little difference in knowledge of mangrove ecosystems between children of fishing and non-fishing families. Overall children’s knowledge of mangrove ecosystems appeared better than for seagrass beds, possibly reflecting their greater experience of mangroves as shown in Section 4.3.1.3.

#### 4.3.2.3. Knowledge of coral reefs

Coral reefs are one of the coastal ecosystems that play an important role for coastal communities. Coastal communities use coral reefs for many purposes; for instance they provide protein for local communities. This research was to identify the knowledge of children in coastal communities about coral reefs.

Similar with seagrass beds and mangrove forests ecosystems, children were given a picture of a coral reef community containing ten animals and plants that are commonly found in coral reefs (see Appendix A) and asked to identify as many as they could. Other questions looked at the conceptions that children hold about coral reef ecosystems. In addition, children and elders were interviewed to gain deeper understanding about their knowledge and experience in coral reefs.

Table 11 What children know about coral reefs

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>Can you identify...? (Pictures of 10 plants and animals provided)</b>					
< 4	10	34%	27	60%	50%
4 – 7	17	59%	16	35%	45%
> 7	2	7%	2	5%	5%
<b>Coral reefs are only found in Indonesia</b>					
Yes	12	41%	19	42%	42%
No	11	38%	11	24%	30%
I don’t know	6	21%	15	34%	28%

<b>Coral reefs are a coastal ecosystem</b>					
Yes	21	72%	26	58%	63%
No	4	14%	7	15%	15%
I don't know	4	14%	12	27%	22%
<b>Coral grows</b>					
Yes	22	76%	30	67%	70%
No	4	14%	4	9%	11%
I don't know	3	10%	11	24%	19%
<b>There are many kinds of coral</b>					
Yes	25	86%	31	69%	76%
No	1	3%	3	7%	5%
I don't know	3	11%	11	24%	19%
<b>Coral is an animal</b>					
Yes	15	52%	13	29%	38%
No	8	27%	17	38%	34%
I don't know	6	21%	15	33%	28%

One half of the children from fishing and non-fishing families were able to identify less than 4 right answers about coral reefs community, including 60% of children from non-fishing families. Almost half (45%) of the children could identify between 4 and 7 plants and animals, with more correct identification by fishing family children. Only 5 percent of children were able to identify more than 7 right answers. A number of wrong answers due to their concepts about animals were given, for instance many children answered octopus for the pictures of brittle stars, which have tentacles like octopus.

Forty two percent of children answered that coral reefs are only found in Indonesia. Twenty eight percent of children also answered that they did not know the answer to this question. Coral reefs are found in many parts of the world so this finding indicates that children have lack of knowledge about coral reef geography.

Nearly two thirds (63%) of children agreed that coral reefs are coastal ecosystem. Both villages have coral reefs that are close to the land. It is possible that some students did not understand the term 'ecosystem' in Bahasa but they should have been taught this term by their level of schooling.

More than two thirds of children knew that coral can grow. This shows some understanding of coral reefs as it could be easy to consider that coral is not live and cannot grow. Children see the coral from its shapes. Seventy six percent of children agree that there are many kinds of coral. Children from fishing families appeared more knowledgeable about this question, perhaps due to their greater experience of coral reefs.

There appeared to be much more confusion over whether coral is an animal. Half of the children from fishing families were agreed that coral is an animal while only 29% children from non-fishing families were agreed. As coral looks like a plant in the sea, it is possible that some children think it is a plant.

In the focus groups with the elders, they commented on the good condition of the coral reefs. This was the case for both villages, as the following comments show “Coral reefs are still in good condition” (Ae2), and “The coral reefs in this village (Pelago village) are still in good condition” (Se3). In fact, reefs are both areas are suffering compared to what they could be like.

Table 12 What children know about the importance of coral reef for others

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>I think coral reefs are important for other animals and plants</b>					
Yes	16	55%	26	58%	57%
No	8	27%	7	15%	20%
I don't know	5	18%	12	27%	23%

More than a half of children from fishing and non-fishing families were agreed that coral reefs are important for other animals and plants. It was also reflected in their answers from interviews that coral reefs were associated with fish and other animals “Coral reefs are where fish live” (Sf6c). One child from a fishing family noted the ornamental fish in the coral reef, “There are ornamental fishes in coral reefs” (Sf5a). Another child from a fishing family described that “We can find fishes and sharks in coral reefs” (Af6b).

Teachers were asked about what they knew about coral reefs. Unfortunately, not one of them was able to answer the question.

Elders stated about a coral reef that its function was a spawning ground for fish “Coral reefs have function for fish spawning and as barrier” (Ae1), “Coral reefs have function to protect and as home for fishes” (Ae3). As a free diver, one fisherman commented that “Coral reefs are like jewellery in the sea. Only ornamental fishes live there” (Se2). It might be due to his own experience when he visited coral reefs.

An open question was asked about coral reef ecosystems to allow children to express their ideas

Table 13 Do children know what can harm coral reefs?

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>If you know of any things that can harm coral reefs, please write them in the box below:</b>					
Using dynamite and cyanide to catch the fish	7	24%	9	20%	21%
People take it for making lime or build a house	0	0%	2	4%	3%
Flood	0	0%	1	3%	1%
No answer	22	76%	33	73%	75%

The table shows that a small number of children from fishing and non-fishing families (21%) know that using dynamite and cyanide can harm the coral reefs. A number of children from non-fishing families (3%) know that coral mining can also harm coral reefs. This is due to their experiences that their family, other relatives or people in their villages are doing coral mining for particular purposes. In the interviews, children were asked about the impact if coral reefs ecosystem was destroyed. None of the children was able to answer.

### *Summary*

Knowledge amongst children of what lives in the coral reef ecosystem was relatively poor. There appeared to be confusion over whether coral was an animal and about the widespread distribution of coral reef ecosystems. However there appeared to be reasonable understanding that coral could grow, that there were several types, and that coral ecosystems are coastal, particularly amongst children from fishing families. This is perhaps not surprising as these fishing family children reported more experience at coral reefs as shown in Section 4.3.1.3. Children understand that coral reefs have relation with animals such as fish. Elders have the same comments about association between coral reefs and fishes. Teachers have a lack of knowledge about coral reefs ecosystem.

#### *4.3.2.4. Teaching and learning marine ecosystem/environment at school*

Teachers were asked about their experiences in teaching about the marine ecosystem/environment in their classroom. Two teachers did not have any experiences in teaching about marine environment, “My students don’t learn about marine environment from me” (Padma), “No, but I am interested to” (Paras). One teacher said that he did teach about fishing activities and marine resources, “I teach the students about what fishermen use for catching the fish and about marine resources” (Taranga). Teachers were facing some challenges in teaching about the marine environment. Their lack of knowledge and resources seemed to be the main problems, “I don’t have any references and experiences about the marine environment” (Triya); Human resources, time and fund” (Paras). Another problem was described as, “The students’ ability to understand in Bahasa Indonesia is limited” (Padma). Although Bahasa Indonesia is used formally in government schools, many schools in rural areas still using local language for communication in the classroom in many cases. However, one teacher showed his confidence that it is not difficult to teach about marine environment “No, because this school is close to the sea and it is easy to take the students to the sea” (Taranga), showing some belief in the value of experience in learning.

4.3.2.5. Summary of knowledge of marine ecosystems

From the table and figure below, it shows a comparison of children’s knowledge about seagrass beds, mangrove forests and coral reefs.

Table 14 Children's knowledge about seagrass beds, mangrove forests and coral reefs

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>Seagrass beds identification</b>					
< 4	0	0%	11	24%	15%
4 – 7	11	38%	28	62%	53%
> 7	18	62%	6	14%	32%
<b>Mangrove forests identification</b>					
< 4	0	0%	2	4%	3%
4 – 7	6	21%	15	33%	28%
> 7	23	79%	28	63%	69%
<b>Coral reefs identification</b>					
< 4	10	34%	27	60%	50%
4 – 7	17	59%	16	35%	45%
> 7	2	7%	2	5%	5%

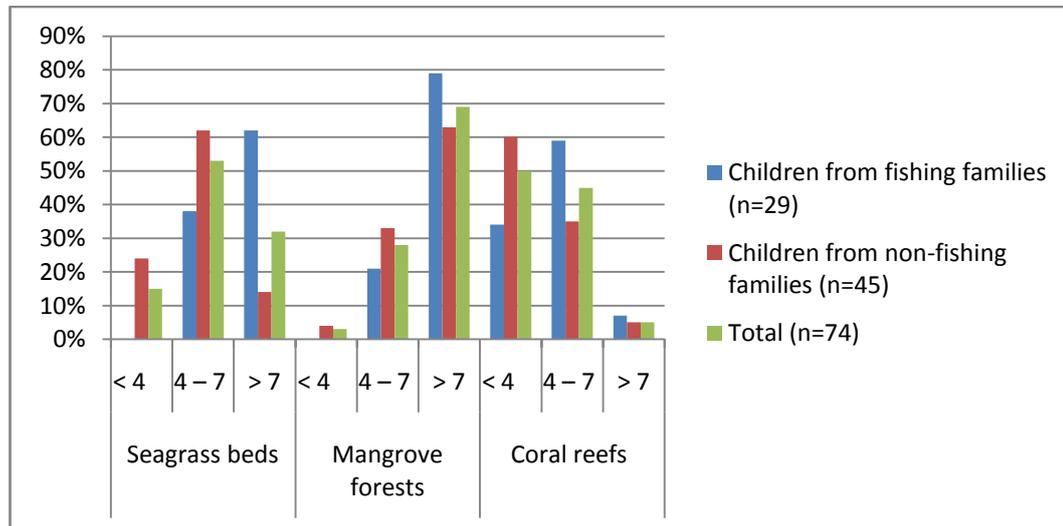


Figure 4 Children's knowledge about seagrass beds, mangrove forests and coral reefs

Children from fishing and non-fishing families have good understanding about mangrove ecosystems followed by seagrass beds and coral reefs. With the highest percentage of children (see Figure 4) visiting mangrove forests, it shows that children experiences may play an important role to construct children understanding about their environment. Their easy access to mangrove forests may have influenced their understanding and connectedness to this ecosystem.

Some children hold some misconceptions about seagrass consumers, predators in mangrove forests and coral reefs. However, they were aware that these three ecosystems have important role for others animals such as food resources and protection.

A small number of children from fishing and non-fishing families were able to identify some things that can harm seagrass beds, mangrove forests and coral reefs which are caused by human activities. However, they lacked knowledge that marine ecosystem also can be destroyed by natural disasters.

Teachers have a lack of information about seagrass beds, mangrove forests and coral reefs which they explained was due to their origin as not being from coastal regions. Elders have knowledge around the function of seagrass beds, mangrove forests and coral reefs and mainly about its conditions. Some teachers have no experiences in teaching about marine environment in their classroom. Teachers have some challenges in teaching marine environment such as lack of funds, material resources and lack of experiences.

#### ***4.3.3. Marine values and attitudes***

Marine values and attitudes of coastal community influence how they manage their local marine environment. This section presents findings about children's and elders' values and attitudes towards the marine environment. Data to inform these findings were collected in the questionnaire and focus group interviews.

#### *4.3.3.1 Values and attitudes towards fishing practices*

The practice of using destructive fishing such as using dynamite and cyanide to catch fish existed many years ago. In the recent years, these methods have been banned by local regulations and the government as well. However, the weaknesses of government control and easy to get dynamite and cyanide has seen these practices continued. These emerged during discussion about fishing practice, and personal interactions and ways of using the coast and the sea.

Although the presence of destructive fishing practices is well-known, it is not easy to get information from people in coastal villages since they tend to state that they do not know about it, or that fishermen from other villages have done these practices. Children and elders were asked in focus groups about their knowledge of these destructive practices. Some children stated that they knew that these practices happened, whereas elders stated that they did not happen. For example, one child from a fishing family expressed the feelings “I don’t know but I am really sad because they destroyed the sea” (Sf6b). Another child from a fishing family commented “I have seen people using cyanide to catch the fish in Gili Sepia (an island nearby)” (Sf5a). And another child stated “I never saw people catching fish using dynamite but I have seen people using cyanide in the sea and I don’t like it!” (Af6b). Whether or not the practice of using cyanide actually occurs, the children were certain that they did approve of this practice.

In their focus groups, the elders shared their opinions about destructive fishing practices. Two fishermen from Pelago village mentioned that they did not know about these practices, “I don’t know anything about this” (Se2). One fisherman knew about this practice and stated “Long time ago some people used dynamite and cyanide to catch fish. But after they realized that they destroyed the environment, they stopped using it. From my point of view, those practices destroy the environment and I don’t like it” (Ae1). Other fishermen expressed the dangers to the environment of using dynamite and cyanide to catch fish, “I don’t like because it destroy coral reefs” (Ae3), and “It will destroy the coral reefs and it will take time to recover” (Se3).

#### 4.3.3.2. Values and attitudes towards care for the sea

For many years, many beaches in coastal villages have been used for dumping rubbish and as a toilet. Villagers still use traditional ways to treat their rubbish such as throw it away, buried or burned it. And only a number of households in coastal villages have septic tanks for human waste.

Some questions were asked about values and attitudes among children from fishing and non-fishing family for how they perceive the coastal environment. Responses are shown in the table below:

Table 15 Children's views about using the beach for dumping rubbish and disposal of human waste

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>I think the beach &amp; coastal area in my village are dirty</b>					
Yes	14	48%	15	33%	39%
No	12	41%	25	55%	50%
I don't know	3	11%	5	12%	11%
<b>People should not throw the rubbish in the sea</b>					
Yes	26	90%	32	71%	78%
No	1	3%	11	24%	17%
I don't know	2	7%	2	5%	5%
<b>I think it is ok to use the sea for toilet</b>					
Yes	17	59%	13	29%	40%
No	8	27%	17	38%	34%
I don't know	4	14%	15	33%	26%
<b>I think it is ok to throw rubbish in the deep sea</b>					
Yes	14	48%	14	29%	38%
No	11	38%	21	45%	43%
I don't know	4	14%	10	26%	19%

Fifty percent of children were not agreed that their beach and coastal area are dirty. However, the highest percentage of children was from non-fishing families while 48% children from fishing families were agreed. Children from fishing families who mostly visit the coastal area more often compared with non-fishing

children have seen this area on a day by day basis. They see what is going on in the coastal area, for example people throwing rubbish along the coast.

Seventy eight percent of children were agreed that people should not throw rubbish in the sea. The highest percentage was from fishing families. When people throw rubbish in the sea it won't solve the problems because the waves during the high tide will bring the rubbish back to the beach. Children would not be able to play in the beach freely if the beach was dirty and it will make fishermen have some trouble because some plastic bags could be dragged into the boat propellers.

Fifty nine percent of children from fishing families were agreed that it is ok to use the sea for a toilet while only 29% non-fishermen children agreed. Some fishing villages in Lombok still use the beach and the sea as toilet, because toilets are not available in their houses. This habit has passed from generation to generation. Non-fishing children usually live further from the beach so it is not easy access for them as a toilet. They may have a toilet in their house as well. The fishing village from which the surveyed children came also has a problem with its water supply so they have no option but to use the beach or the sea.

Approximately equal numbers of children agreed and disagreed that it was OK to throw rubbish in the deep sea with more children from fishing families agreeing. I think this finding may be because children from fishing families have experienced throwing rubbish in the deep sea and because they have boat to go to the sea. Children from non-fishing family usually throw, bury or burn their rubbish in their backyard.

There appears to be an interesting anomaly here, that although the children from fishing families realize that their beach is dirty and people should not throw rubbish in the beach or deep sea, but their practices were different. This is because traditional practices may have an influence affecting children's views. It is difficult to change the children's attitudes since these practices have been run for a long time and it is not easy to change them.

One of the values that coastal community hold is to respect the sea since the sea provides life for them. The children were asked who had taught them to respect the sea.

Table 16 Who taught children to respect the sea? (Note: whilst children were able to select more than one response, all children only selected one)

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>I respect the sea because:</b>					
My parents told me to	14	49%	19	42%	45%
The Koran tells me to	6	21%	3	7%	12%
I like the sea	6	21%	17	38%	31%
My grandparents told me to	1	3%	2	4%	4%
My teachers told me to	1	3%	3	7%	5%
My friends told me to	1	3%	1	2%	3%

It shows that parents have the highest position in teaching the children about respecting the sea. One child from a fishing family commented “It is important because my father is looking for fish from the sea” (Af6b). Thirty percent of children are respecting the sea because they like the sea. The children view the sea as a place that is giving them benefits and makes them feel that it is important to respect it. As a child from a fishing family stated “Yes because the sea is fish resource” (Af5a). One child from a non-fishing family said “Important for fishermen (An6a). There were 12% of children who responded that they respect the sea because the Koran tells them to. Commonly, children have religious activities such as reciting Koran and listening Imam’s speech after their praying time mostly in the mosque.

There is a tradition in coastal communities to respect the sea by doing a ceremony called a sea offering ceremony. The community expresses their gratitude to God for the fish they have caught and for safety when they are on the sea. This is the reflection of the values of the sea for coastal villagers and how they should treat the sea. The following comments reflect that the sea is important in their life since it is a food resource and income for fishing families. One fisherman from Thalasso village described the purpose of sea offering ceremony:

*The purpose of sea ceremony: It is like expression of gratitude to God. Usually we slaughter the buffalo. The buffalo head will throw to the sea and this ceremony will lead by shaman. The purpose of this event, we hope there will be more fishes to catch in the following year (Ae2).*

Others fishermen expressed that there was take and give. They should respect the sea because the sea provide them food and as a give, they give the buffalo head as a symbol of appreciation.

*There is sea offering ceremony every year. We slaughter the buffalo. There is a meaning that we took from the sea, so we should feed the sea. We respect things that already give us food (Se1).*

*Everything that we got from our ancestor, we should be grateful by give them gifts. By doing sea ceremony and slaughtering the buffalo, we thank our ancestor. And it is good because we express our grateful (Ae3).*

Although the villagers are muslim, they are still running the animism practice such as the sea offering ceremony. However this cultural tradition persuades them to have good manners and give a high respect to the sea.

#### 4.3.3.3. Values and attitudes towards different marine ecosystems

The following table shows whether the children participants believe that the ecosystems of seagrass beds, mangrove forests and coral reefs are important to them.

Table 17 Which ecosystem is more important for children

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>I think seagrass is important for us</b>					
Yes	19	65%	19	42%	51%
No	7	24%	15	33%	30%
I don't know	3	11%	11	25%	19%
<b>I think mangrove forests are important for us</b>					
Yes	25	86%	34	75%	80%
No	1	3%	1	3%	3%
I don't know	3	11%	10	22%	17%

<b>I think coral reefs are important for us</b>					
Yes	21	72%	24	53%	61%
No	4	14%	8	40%	16%
I don't know	4	14%	13	7%	23%

Approximately half of the children answered that seagrass beds were important for them with more children from fishing families agreeing with this than from non-fishing families. Mangrove forests have the highest percentage of children agreeing that that ecosystem is important for the children. A child from a non-fishing family commented that the importance of mangrove forests for them was because mangrove forests provide food “Mangrove forests were important, because I can eat fish” (Sn5a). Children from fishing families believed that mangrove forests are important for the protection, e.g. “Mangrove forests, because they can protect land from the waves” (Sf5a), and “Mangrove forests, because they protect land from tsunamis” (Af6b).

Sixty one percent of children answered that coral reefs were important for them. Once again children from fishing families were more likely to respond that coral reefs were important to them than children from non-fishing families. . This may be because coral reefs are giving benefits for coastal villagers as food resources and other purposes. One child from a non-fishing family commented “Coral reefs are important because my mother uses coral for chewing betel and coral is also used for building material” (An6a). Chewing betel nut is common in many parts of Indonesia including Lombok Island. Lime paste is one of the ingredients used when chewing the meat of the betel nut. They prefer to use coral rather than other sources of lime because it produces a purer white powder. To make the lime paste, people burn the coral and crush it to make powder. They add water into the powder to make paste-like.

Table 18 Which ecosystem that children want to learn at school

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>I think I should learn about seagrass beds at school</b>					
Yes	21	72%	32	71%	72%
No	8	28%	10	22%	24%
I don't know	0	0%	3	7%	4%
<b>I think we should learn about mangrove forests at school</b>					
Yes	21	72%	35	78%	76%
No	6	21%	3	7%	12%
I don't know	2	7%	7	15%	12%
<b>I think I should learn about coral reefs at school</b>					
Yes	21	72%	30	67%	69%
No	7	24%	5	11%	16%
I don't know	1	4%	10	22%	15%

Generally, children from fishing and non-fishing families agreed that they should learn about seagrass beds, mangrove forests and coral reefs at school. It shows that they have positive attitudes toward these ecosystems. There is some correlation between their belief of the importance of the marine environment and their perceived need to learn about it.

For many years, coral reefs have been associated with coastal communities since coral reefs provide resources of protein and economy for them. However, the coral reefs condition has been in decline due to over-exploitation. The following questions were to get understanding on what children view about coral in their life.

Table 19 What children view and take care of coral

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>I think it is ok that people take coral for building their house</b>					
Yes	17	59%	24	53%	55%
No	5	17%	11	24%	22%
I don't know	7	24%	10	23%	23%

<b>I think collecting coral is good</b>					
Yes	23	79%	26	58%	66%
No	4	14%	8	18%	16%
I don't know	2	7%	11	24%	18%
<b>I think it is a bad idea to use dynamite to catch the fish in the coral reefs</b>					
Yes	25	86%	25	55%	68%
No	3	10%	11	24%	19%
I don't know	1	4%	9	21%	13%

Only half of the children from fishing and non-fishing families agreed that it is ok to use coral for building the house, while a quarter were unsure. Coral have been mined in many parts of Indonesia including Lombok Island for decades. People mined the coral for construction purposes such as house foundation or for roadbeds. Coral is good for construction because it is strong, easy to get and relatively cheap compare with other building materials.

Related with previous questions, 66% of children agreed that collecting coral is good with the highest percentage being children from fishing families. It shows that children believe that collecting coral is good since their communities allowed this practice to happen from time to time. And there is strong connection with children from fishing families' background, perhaps because they have traditionally had easier access to the reefs and have used coral as a resource.

However, two-third of the children were not agreed with using destructive fishing methods to catch fish, with 86% of children from fishing families being opposed to this. This appears contradictive because children agreed with collecting coral as building materials or using the lime produced by coral for chewing with betel nut, but they were not agreed with using dynamite and cyanide to catch the fish in coral reefs. Children seem to believe that as long as people take the coral for their own needs and do not unnecessarily destroy it, they do not mind. This indicates the need for careful education that addresses the value systems of the children.

#### *4.3.3.4. Summary of marine values and attitudes*

While it was difficult to get clear opinions regarding destructive fishing practices, children and elders were agreed that these practices were bad. They have positive values that those methods will harm the marine environment. There was some acknowledgement of pollution of the coastal areas and in general terms children were opposed to putting rubbish and human waste into the sea. However, children from fishing families in particular were less opposed to putting rubbish in the deep sea, and most children from one village were less opposed to using the sea as a toilet, perhaps reflecting traditional practices.

Most children reported that their respect for the sea came from what their parents had told them, but approximately a third respected the sea because they liked it. Coastal communities have long traditions to respect the sea by doing sea offering ceremony with aims to respect what the sea has given them as food, and this was evident in the responses of the elders. This appears to reflect a generally positive attitude towards the sea as a provider of food and other resources. Although the villagers are muslim, the animism practice like sea offering ceremony has persuaded them to respect the sea. This was also indicated by the children's responses that each of the three marine ecosystems investigated in this study were important to them, and the degree of importance of each seemed to be influenced by children's experiences in these ecosystems as well as their understanding of the resources provided by those ecosystems. Further evidence of positive attitudes towards these environments was shown by approximately 70% of the children believing that they should learn about these places at school.

#### *4.3.4. Sustainability*

The concept of sustainability not only deals with environmental protection but also how people can achieve a balance socially, economically and ecologically in the present time and the future.

#### *4.3.4.1. Sustainability knowledge*

The concept of sustainability is important when considering environmental issues. In Lombok, a key concept for sustainability is conservation. This study sought to explore the ideas that children held about this concept in the local environment. Teachers and elders were asked more directly about the general concept of sustainability but this was felt to be a too complex concept for children to respond to.

This section presents findings about teachers' and elders' knowledge about sustainability, and children's knowledge about sustainability related to the marine environment. Data to inform these findings were collected in the questionnaire and focus group interviews.

From interviews with the teachers, only one teacher of the four was able to explain their point of view about sustainability. He said, "Sustainability is people's effort to rehabilitate the environment for today and the future" (Paras). Other teachers said that they never heard of and did not know about it. Elders shared their view about what they thought that sustainability might be about. "Seagrass beds, mangrove forests and coral reefs should be in good condition for future generations" (Se1) and "Sustainability is about conserving and protecting the environment and this is the government's duty" (Ae1). Although the teacher and the elders were not able to define the term of sustainability, they could describe some of the meaning of sustainability. They noted the ideas of intergenerational equity and future focus. The term sustainability is not much used in wider society in Indonesia. This term is much used by governments, non-governmental organizations and higher academic society. This may be the reason why the teachers and the elders were not familiar with the term of sustainability.

To explore the children's ideas about conservation, questions were asked in the questionnaire and focus groups. Firstly, the children were asked if they believed there would always be fish to catch (see Table 21).

Table 20 What children believe about fish stocks

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>I think there will always be plenty of fish to catch</b>					
Yes	23	80%	30	67%	72%
No	3	10%	8	18%	15%
I don't know	3	10%	7	15%	13%

The majority of children believed that there will always be plenty of fish to catch. It might be due to their experiences that they never face difficulties to get fish. The other motive was the children hope that there will be fish to catch otherwise they will get hungry.

To further explore this idea in the interview sessions, children were asked what would happen if there were no fish in the sea. Their responses reflected this feeling and the importance of fish in their lives. Two children from fishing families expressed their feelings “I will be disappointed because there will be no fish to catch” (Sf5a) and “I am not pleased because people can't get fishes from the sea” (Af6b). Some children commented about fish stock and its consumption “It's hard (difficult) because there are no fish to eat” (Sn5a), “Sad because I can't eat fish. I don't have appetite if there are no fish on my menu” (Af6a). However, one child from a fishing family was less concerned about the fish stock since his father met their economic needs by having another job, “If we can't get the fish in the sea, just go home. My father can work as a driver” (Af5a). This indicates that fish have strong connections with consumption. Other impacts were still unknown by children.

Furthermore, the children were asked their ideas about their village in the future. The majority of children wanted their village to be like a big town with a shopping mall, and to be more populated. It is of interest that some of the key causes of environmental problems, consumerism and over-population, are seen as desirable, indicating a need for education about these links for the children.

The questionnaire also asked the children to consider how their lifestyles may impact on the three main marine ecosystems. The responses to this reflective question are shown in Table 22.

Table 21 Children's view about the impact of their daily activities on seagrass beds, mangrove forests and coral reefs

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>My daily activity can cause damage to seagrass beds</b>					
Yes	9	31%	13	29%	30%
No	14	48%	22	49%	49%
I don't know	6	21%	10	22%	21%
<b>My daily activity can cause damage to mangrove forests</b>					
Yes	10	34%	13	29%	31%
No	14	48%	22	49%	49%
I don't know	5	18%	10	22%	20%
<b>My daily activity can cause damage to coral reefs</b>					
Yes	13	45%	14	32%	36%
No	9	31%	19	42%	39%
I don't know	7	24%	12	26%	25%

The data in the table shows that most children did not make the connection between their lifestyle and its impact on the ecosystems or were uncertain about it. Almost half of the children from fishing families thought that their daily activities could cause damage to coral reefs. This may be because when they go fishing in the coral reefs, they may throw an anchor onto the coral reef, take fish or coral for building or throw rubbish into it. The data indicates that the children as a group was unsure about any impact their lifestyles were having on the ecosystems as their activities particularly in the seagrass beds and mangrove forests were mainly fun activities and they may not see any exploitation of these two ecosystems. The pattern of responses was similar to that of their experiences in those environments, suggesting a link between their knowledge and their experiences.

Finally, children were asked for their knowledge about what their community attitudes were towards the marine ecosystems (see Table 23).

Table 22 What children think about their community's attitudes toward the coastal ecosystems

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>The people in my village care about the seagrass beds</b>					
Yes	17	59%	20	44%	50%
No	8	27%	11	24%	26%
I don't know	4	14%	14	32%	24%
<b>The people in my village care about the mangrove forests</b>					
Yes	22	76%	33	73%	75%
No	2	7%	2	5%	5%
I don't know	5	17%	10	22%	20%
<b>The people in my village care about the coral reefs</b>					
Yes	19	66%	28	62%	63%
No	5	17%	6	13%	15%
I don't know	5	17%	11	25%	22%

Responses to these reflective questions may be influenced by the experiences and values held by the children towards these ecosystems. The findings show that the children believe that the people in their village care about the mangrove forests, and this may have been influenced by their knowledge that there had been some projects to re-plant the mangrove forests. It may also reflect the perceived value of those ecosystems to the community, as children had earlier responded that each ecosystem was important to them in similar proportions to this data.

#### 4.3.4.2. Sustainability values and attitudes

This section presents findings about respondents' values and attitudes towards sustaining the marine environment. Data to inform these findings were collected in the questionnaire and focus group interviews. Children were asked about their motivation towards protecting the three marine ecosystems.

Table 23 What is children's motivation towards protecting the ecosystems

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>I would like to protect seagrass beds</b>					
Yes	22	79%	21	47%	58%
No	4	14%	19	42%	31%
I don't know	3	7%	5	11%	11%
<b>I would like to protect mangrove forests</b>					
Yes	20	69%	30	64%	67%
No	4	14%	7	15%	15%
I don't know	5	17%	8	18%	18%
<b>I would like to protect coral reefs</b>					
Yes	22	79%	25	56%	64%
No	4	14%	10	22%	19%
I don't know	3	7%	10	22%	17%

Children seem to be generally motivated to protect these ecosystems. While there is little difference in their motivation to help the three environments, they showed slightly more concern towards mangrove forests and coral reefs than seagrass beds as a whole. There is an indication that children from fishing families expressed more concern than children from non-fishing families in protecting the ecosystems, and they were slightly more concerned about the sea-based ecosystems than the land based one.

Children were also asked whether they felt they could do something to help protect the ecosystems.

Table 24 Children's views about their ability to help protect the ecosystems

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>I can do something to help seagrass beds</b>					
Yes	14	48%	22	49%	49%
No	10	34%	15	33%	34%
I don't know	5	18%	8	18%	17%

<b>I can do something to help mangrove forests</b>					
Yes	18	62%	34	75%	70%
No	6	21%	4	9%	14%
I don't know	5	17%	7	16%	16%
<b>I can do something to help coral reefs</b>					
Yes	18	62%	25	56%	58%
No	8	27%	10	22%	25%
I don't know	3	11%	10	22%	17%

As we can see from the table above, most children believe that they can do something to help each ecosystem, but particularly mangrove forests. This may be because they have strong connections with this ecosystem, and that they have good knowledge and experience about mangrove forests compared with coral reefs and seagrass beds. The finding may also reflect their involvement or knowledge of the re-planting projects undertaken in the mangrove forests.

Further to this finding, the children were asked whether they felt that people needed to change their behaviour to protect the three ecosystems. The data in Table 26 shows that generally, children from fishing and non-fishing families thought that people should change their behaviour to protect seagrass beds, mangrove forests and coral reefs. The children's concern seemed to be highest for coral reefs and this might reflect their concern and awareness that the reefs were being damaged and they thought that people should change their behaviour to better protect them.

Table 25 Children's view about how people act to protect the ecosystems

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>I think people need to change their behaviour to protect seagrass beds</b>					
Yes	21	72%	23	51%	60%
No	3	10%	12	26%	20%
I don't know	5	18%	10	23%	20%

<b>I think people need to change their behaviour to protect mangrove forests</b>					
Yes	17	59%	28	62%	61%
No	5	17%	7	15%	16%
I don't know	7	24%	10	23%	23%
<b>I think people need to change their behaviour to protect coral reefs</b>					
Yes	21	72%	34	75%	74%
No	2	7%	4	9%	8%
I don't know	6	21%	7	16%	18%

As an indication of how many children believed their future would be tied to the marine environment, children were asked directly if they would consider fishing as a livelihood. The findings for this question are shown in Table 27

Table 26 Children's interest in becoming a fisherman (note: the Bahasa word for person who fishes is non-gendered)

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>I would like to become a fisherman in the future</b>					
Yes	20	69%	26	58%	62%
No	7	24%	13	29%	27%
I don't know	2	7%	6	13%	11%

Findings show that most children from fishing and non-fishing families have an interest to become fishermen in the future. This is common that children from fishing and non-fishing families would like to become a fisherman in the future. They live by the sea and their parents and neighbors were fishermen. This show that many children believed their future was tied to the sea. Other children expressed an interest in the focus groups to become farmers like their parents, or to take alternative careers such as in the army.

People's experience, knowledge and values and attitudes will influence how they perceive environmental quality. This section concludes with an analysis of data that explored the children's, teachers' and elders' perceptions of marine conservation.

Table 27 Children's desire to know how to conserve the marine environment

	Children from fishing families (n=29)		Children from non-fishing families (n=45)		Total
	# students	Percentage	# students	Percentage	
<b>I would like to know how to look after our sea</b>					
Yes	24	83%	34	76%	79%
No	5	17%	7	16%	16%
I don't know	0	0%	4	8%	5%

Seventy nine percent of children from fishing and non-fishing families have positive willingness to know how to look after the sea. However, the interviews with their teachers indicated that they haven't been taught about marine conservation in school. When teachers were asked about what they know about marine conservation, only two teachers were able to give ideas about marine conservation. They said, "To keep the environment in good condition" (Paras) and "For example, re-planting the mangrove trees. We should protect the sea and people should not use destructive fishing methods such as dynamite which are not environmental friendly" (Taranga). The teachers did say that it was important to teach marine conservation. They felt that children could learn marine conservation in subjects that they teach. As two teachers explained, "I can teach about marine conservation in science subjects" (Padma), "I teach PPKn which has a strong relationship with attitude. The values of love and care about should not be only for people but also for the environment. If the environment is destroyed, people also will get the impact" (Paras). The teachers were also asked where they could teach about marine conservation. They all agreed taking the children to the field is the best way "Take them to the fields, so they will see the environment in the real conditions" (Paras) and one teacher added that using materials to support them was possible, "Use materials such as posters in the classroom" (Padma). Another teacher responded that to be able to conserve the marine environment it should start from ourselves that we have willingness to conserve and protect it, "Firstly, we keep in mind and heart that we want to protect and conserve our sea" (Taranga).

Elders have the same opinion that it is important to teach the young generation about marine conservation "It is important and it is a must. So our children are

able to become role models for their children and they will give their experience about conservation” (Se1), “It is very important for us who live in coastal region so our future generations will able to use this environment” (Ae1). They also noted that taking them to the real situation helped children learn, “Take them to the sea” (Se1). Other elders expressed that they should teach values and attitudes toward the marine environment, “We teach them not to cut down the mangrove trees. We should teach them not to destroy the coral reef” (Ae2), “From now on, we should teach our children to use fishing gears that are environmentally-friendly. Because the fishes that were caught by dynamite and cyanide are in bad conditions” (Ae3). Elders shared their thought that they all have responsibility to teach their children about marine conservation “Firstly, their parents and secondly, their teachers” (Se1), “Parents, teachers and communities” (Se3). However, one elder felt that it was the teachers’ responsibility “It is up to the teachers what they want to teach” (Se3).

#### *4.3.4.3. Summary of sustainability knowledge, attitudes and values*

The teachers and elders have a concept about sustainability that is about protection and future generations that are able to use the marine resources. Children have a belief that there will always be fish since they never face difficulties to get fish.

Children from fishing families have concerns that their daily activities can cause damage in seagrass beds, mangrove forests and coral reefs since they have stronger connections with these ecosystems than children from non-fishing families. Children have a point of view that the people in their village have greatest concern about mangrove forests since some re-planting mangrove trees have been done in their villages. Such projects demonstrated to them the value the community attaches to a particular resource

Children have strong commitment to looking after the sea. Teachers and elders have the same opinion that is important to teach children or young generations about marine conservation and that the best way is through learning outside the classroom.

#### **4.4. Chapter Summary**

This chapter presents the finding of the research. The demographic illustrates the characteristic of the participants. Seventy four children from two schools, their teachers and elders from two different coastal villages participated in completing questionnaires and interviews. The research investigated children experiences with their coastal area. The result shows that children from fishing families have fishing related activities while children from non-fishing families do pleasure activities when they visit the coastal area. Children from fishing families go to coral reefs and open sea as fishing location and children from non-fishing families go fishing in the location near the beach. Mangrove forests are the coastal ecosystem that children from fishing and non-fishing families most visited. Children from fishing families visited coral reefs more and all children visited seagrass beds less. These experiences may affect their environmental knowledge on these ecosystems. The findings have shown that children's knowledge in mangrove forests is better in this ecosystem compare with two other ecosystems. Children form fishing families have strong connectedness in coral reefs due to their experience there.

Children have a number of issues that reflect their lack of knowledge of seagrass beds, mangrove forests and coral reefs ecosystems. Children held some misconceptions about seagrass bed consumers and mangrove forests predators. Children were only able to identify the human factors that can destroy seagrass beds, mangrove forests and coral reefs. However they are not able to explain natural factors that also can destroy these ecosystems. Lack of knowledge is one of aspect that can determine the weak connection between environmental concern and attitudes toward the marine environment.

Children have positive values because they did not agree with destructive fishing practices such as using dynamite and cyanide. Children from fishing families who have strong connection to coastal area feel negative about their coastal area. They find dilemmas, on one side they have positive values toward the coastal environment, on the other side, they have negative attitudes due to their traditional practices that are still running. Traditional practices such as using the beach for

dumping waste are preventing children to have positive attitudes. It shows that environmental concerns are confused among children in these coastal villages.

Children's relationship with the marine environment will determine the importance of these marine environments for them. Mangrove forests are the ecosystem that is important for children from fishing and non-fishing families due their experiences with this ecosystem. Generally children have positive values to learn about marine environment at school and have strong commitment to looking after the sea. Knowledge about marine environments is important to influence attitudes.

Some issues arise from the data analysis which is discussed in the next chapter:

- ④ Children experiences in the local marine environment have a connection with their knowledge about these environments.
- ④ The conceptual understanding of the environment as a place that contain living things and does something to people
- ④ Values and attitudes toward the environment
- ④ Teaching and learning about marine environment
- ④ The ideas about sustainability and the values and attitudes toward sustainability
- ④ Education for sustainability

## **CHAPTER 5**

### **DISCUSSION, CONCLUSIONS, AND IMPLICATIONS**

#### **5.1. Chapter overview**

This chapter discusses the findings of the study. The discussion is considered in five theme categories that emerged from data analysis in relation to the research questions and the literature reviewed for this study. The conclusions from the findings are discussed next and the final section is about implications and recommendation for further research.

#### **5.2. Knowledge about local marine environment**

This study examined relationships between children's experiences in their local marine environment and their knowledge about this environment. As Cin and Ozcelik (2002) stated the evidence demonstrated that there is a strong relationship between children's experience in their local environment and their knowledge about it. This study examined children's experience at the beach or in the sea, and their experiences in seagrass beds, mangrove forests and coral reefs ecosystems.

##### *Children experiences at the beach or sea*

It is common for children who live in coastal villages to visit the beach or the sea because it is relatively close to their houses. There were frequency and purpose differences between children from fishing families and children from non-fishing families. Children from fishing families more frequently visited the beach and the sea compared with children from non-fishing families. This is because their houses are close to the beach and they tend to do their activities that are relatively close to their houses. Children from fishing families have activities at the coast which related to consumption and economic purposes. Their activities have strong connection with fisheries activities, for example, fishing activities or helping their parents to feed the shrimps in the floating cages, besides swimming which is mostly what they do when they visit the beach or sea. On the other hand, children

from non-fishing families commonly have activities which are related to pleasure purposes. They like swimming and collecting the seashells from the beach or sea.

Furthermore, children from both schools in this study live in the coastal villages where local marine environments such as seagrass beds, mangrove forests and coral reefs exist. From the findings, children from fishing families visited coral reefs most, followed by mangrove forests and seagrass beds. Children from non-fishing families visited mangrove forest most, followed by coral reefs and seagrass beds.

*The environment is a place that contains living things*

The children's engagement with the marine environment appears to have influenced their knowledge about their local marine environment, as Cin and Ozcelik (2002) stated about the research by May (1998), that children's first-hand experiences influenced their conceptual understanding about environment. As Loughland et al. (2002) suggested the students in this study identified the environment as a place that contains living things.

Seagrass beds were the ecosystem which children from fishing families and non-fishing families reported visiting least. From the questionnaire, children from fishing families demonstrated better knowledge of plants and animals living in seagrass beds than children from non-fishing families. Seagrass beds are an ecosystem in which its animals and plants live underwater. Even though this ecosystem was close to the beach and anybody can go to seagrass beds easily, children may not have observed them closely since they are underwater. Children from fishing families appear to have adequate knowledge of seagrass beds possibly because they are from fishing families who have related fisheries activities in seagrass beds, for example, fishermen sometimes collect shell or sea urchins on low-tide or sea cucumbers from seagrass beds.

Mangrove forests were the ecosystem where most children had visited and this appeared to be linked to their ability to recognize more plants and animals in that ecosystem than in those they had visited less. As Ballantyne (2004) highlighted,

children's understanding of the concepts of environment are strongly influenced from their personal experiences and observation of the environment. The majority of children from fishing and non-fishing families were able to identify more than seven right answers in the mangrove picture in the questionnaire. Their knowledge has connection to their experience since they visit the mangrove forests most so they have a lot of opportunities to observe easily what animals and plants which live in mangrove forests.

It is similar with coral reefs ecosystems where children from fishing families visited often compared with children from non-fishing families. Their knowledge about coral reefs was better than children from non-fishing families. It is related with their fishing activities. Their experience and their engagement in coral reefs may have made an impact on their understanding about this ecosystem.

However, children's understanding of their local marine environment as a place is only locally. It means they only know about the seagrass beds, mangrove forests and coral reefs that are found in their local marine environment. They only know the animals which live in these three ecosystems. They appeared to have a limited ecological understanding since they did not mention that the ecosystem is dynamic where there were abiotic and biotic elements, interactions between plants and animals or food-web.

Generally, children from fishing and non-fishing families understood their local marine environment as locations where animals live and the place that animals depend on. Although the frequency of children visiting seagrass beds was less compared to other ecosystems, children from fishing and non-fishing families have good knowledge about animals and plants which live in seagrass beds. This might be because they learn from other people in their villages about seagrass beds. Since children have limited knowledge how the marine ecosystems work, they hold some misconceptions about these ecosystems. Children thought that every animal which lives in the seagrass beds consumes seagrass. A number of children thought that starfish which live in seagrass beds consume seagrass. They also thought that sharks also consume seagrass. Moreover, a number of children have also misconception about animals which find food in mangrove forests such

as tuna and dolphin. Also majority children have described brittle stars as octopus possibly because the stars look like octopus which has tentacles instead of arms.

### *The environment does something to people*

Loughland et al (2002) highlight Cullingford's (1996) study that showed that young people were concerned about the environment issues which would affect them. Indonesia had experienced tsunamis hits on the eastern region of Sumatra Island and a huge number of people were victims. One reason why many people became victims was because people cleared the mangrove forests in many areas, and people who lived in small islands had survived because they were protected by mangrove forests. People learnt from this story that mangrove forests have a function to protect the land from tsunamis. Children from fishing and non-fishing families were agreed that mangrove forests protect the land from tsunamis. Elders' view on mangrove forest were similar where mangrove forests have function as protection of the land and they also got benefits from mangrove forests because they were able to take mangrove seeds for re-planting purposes.

The majority of coastal villages in Indonesia depend for their lives on the coral reefs both for their food and economic reasons. Children from fishing families have understanding that coral reefs have provided them food.

Axelrod and Lehman (1993) showed that people have interest in issues if the issues are related to them. In this study, the same feature appeared. It seems that seagrass beds was the ecosystem where children from fishing and non-fishing families have less attention since this ecosystem do not give much benefit directly to them.

### **5.3. Values and attitudes towards the environment**

This study is also looking for the values that children, teachers and elders have about their local marine environment and how these values influence their attitudes to manage their local marine environment. There appeared to be a link between perceived benefits of the environment and the values and attitudes towards the marine environment expressed by participants in this study. Children

have positive values on mangrove forests and coral reefs since these ecosystems provide benefits directly and indirectly to them. Children from fishing families value their beach as a clean place but felt able to continue their activities to dump waste there. Their behaviour was opposite to their values and this may be because it is hard to change the traditional and practical behaviour that has been in the community for a long time.

According to Fien (2002), cultural traditions including religion will influence the pattern of environmental knowledge, attitudes and behavior. Furthermore, Cheong (2002) noted that some traditions, for example, superstition and taboo have encouraged people to respect the environment. Although the majority of Indonesian people are Muslim, many of them still practice animism traditions. In many coastal villages, people have performed sea-offering ceremony every year if they have enough resources to do that. The purpose is to express the gratitude to God because the sea provides them food and they hope they can catch more fish in the following year, and they ask for safety during fishing. Axelrod and Lehman (1993) stated that people's belief and feelings with respect to an issue will lead them to how they will act. Elders from both villages stated that they respect the sea because the sea provides food for them. The majority of children are taught by their parents to respect the sea and some of children taught by others for example their relatives. Parents play an important role to teach their children about respect the sea.

However, some traditional practices which are having a negative impact to the environment still exist. Coral mining that provides building materials and ingredients for chewing betel nut made this valuing of the sea appear contradictory. On one side, coastal villagers approved these practices, on the other side, these practices made an impact to the environment. Moreover, children from fishing families felt that their beach was dirty. They responded that people should not throw rubbish and use the beach as toilet. However, since these traditional practices have been running for a long time and passed from generation to generation, it is likely that children were not able to do more.

Dynamite and cyanide are two kind of destructive fishing practices that are still used in many parts of Indonesia. These practices are known because they are cheap and easy to use. Poverty and lack of knowledge are the main causes for why these practices still exist. Children from fishing and non-fishing families were aware that destructive fishing practices were not good and they could harm the marine environment. They did not agree about these practices because they knew the environment got consequences from these practices (Axelrod & Lehman, 1993). Children were aware that destructive fishing practices were part of the environmental issues and they believed that the environment received negative impact from these practices.

#### **5.4. Teaching and learning about marine environment**

From the findings, it shows that children were willing to learn more about their local marine environment. Children demonstrated a commitment to know more about the environment surround them. The same response came from their teachers. Since children live in coastal villages, it is important for them to learn and understand about their marine environment. Elders thought that as children are their future generation, it is necessary for them to learn about the local marine environment so they can protect their marine environment in the future.

The Indonesian curriculum gives opportunities for educational practitioners to develop environmental education in the Local Content subject area or integrated into every subject. The key dimensions of environmental education, education about, in and for the environment should apply in balanced proportion. However, environmental education application in Indonesian schools is still challenging because it is not compulsory and teachers tend to choose another subject such as culture that they are more familiar with (Brauer, 2002). In addition Brauer mentioned about the majority of teachers who lack of knowledge about environment. The teachers in this study appear to have faced the same things. Three of them did not come from coastal region so they felt their knowledge about the coastal environment is very limited. It is also difficult to find resources about coastal environments.

According to Ballantyne (2004) children's knowledge shapes their conceptual understanding. Their personal experiences and knowledge about other concepts enables educational practitioners to develop learning experiences which support the children to clarify their conceptions. It is important to develop curriculum based on children's understanding about environment that recognizes and addresses ideas of what children know and believe (Loughland et al., 2002).

Local environment issues will help children to enhance their understanding about their environment and their place within it (Loughland et al., 2002). Jensen and Schnack (1997) highlighted that understanding the fundamental causes of environmental problems is essential in developing action competence (taking effective action for the environment). Furthermore, they identified knowledge, commitment, vision and action experiences as the four main components that constitute action competence. Through action competence, children will be capable of dealing with environment issues (Breiting & Mogensen, 1999). Children, teachers and elders have seem to have the commitment to learn the skills and knowledge that are important to develop action competence (Jensen & Schnack, 1997). Furthermore, they recognize that learning outside the classroom is important to develop conceptual understanding (Cin & Ozcelik, 2002).

## **5.5. The ideas about sustainability**

### *Sustainability*

According to Gilding (2000) the concept of sustainability contains the essentials to deal with environmental, social and economic aspects in decision-making. Sutton (2000) highlighted that sustainability has the purpose of taking care of social, ecological and economical factors already existing. Teachers and elders were asked what they know about the sustainability. Only one teacher was able to identify sustainability as people's efforts to rehabilitate the environment for today and the future. The elders have the same view that sustainability is the environment being in a good condition for future generations through protection and conservation efforts. From the teacher's and elders' point of view sustainability has strong relationships with their experiences. Even though

teachers and elders did not mention social and economic factors which become keys of sustainability, it is clear that if they have a good or healthy environment, this environment will support them socially and economically.

The term sustainability does not have much use in wider society in Indonesia. It has limited use for government, non-governmental organizations and higher academic society. This is why other teachers are not familiar with this term. The UN Decade of Education for Sustainable Development (2005-2014) is a good moment to introduce the concept of sustainability into Indonesian schools, including primary schools in coastal regions. The aims of the Decade are to assist the improvement of education quality and learning through education for sustainable development, provide opportunities to integrate sustainable development into their educational reform and develop networks and interaction between stakeholders with the similar purposes (UNESCO, 2008)

Children were asked about the future availability of fish. The majority of them believe that fish will be always available. This might be based on their experience of never facing the difficulties in catching fish. The principle of sustainability for children appeared to be that they always will be able to meet their needs to consume fish in the present and the future time. When asked what would happen if there were no fish in the sea, their answers reflected their feelings about how fish were important in their lives.

Children were asked about the future of their village. The majority said that they wanted their village to become a big town with many facilities such as shops or even a mall. They wanted their village to be more populated because they like to have many friends. Hicks and Holden (2007) found similar responses from their study; 11 year old children have a clear wish for a better quality of life in their local community, for example, more amenities and better relationships between people. Children interpret the abundant facilities, the modern lifestyle as a better quality of life. In Indonesia where advertisements through media such as television have brought strong influence, the people appear to want to become more materialistic.

The findings illustrate that the majority of children from fishing and non-fishing families are interested to become fishermen in the future. This is common since they live in fishing villages and the communities have developed their experiences.

### *Values and Attitudes*

Children from fishing families thought that their activities can cause damage to coral reefs. This reflected their experience in this ecosystem that might have connections with activities which caused damage in the coral reef, for example, dropping the anchor, or coral mining. On the other hand, children from non-fishing families thought that their daily activities did not cause damage in seagrass beds, mangrove forest and coral reefs since they have less interaction with these ecosystems than children from fishing families and their activities were only for fun and did not exploit the ecosystems. Children believe that people in their villages have a high value for mangrove forests. This belief may be related to mangrove forest conservation carried out by their community that demonstrated these values and showed positive attitudes toward mangrove forests.

Gambini (2006) proposed values systems sets such as religious, ethics and legal systems are essential in influencing what individuals are supposed to do, their actual behavior. Formal education has become important to assist the children investigate the environmental issues through knowledge and values that will allow them to live sustainably (Hicks & Holden, 1995). Hicks and Holden (1995) linked environmental education with social education, showing that this will assist children understand the environment and to live in harmony with it.

### *Education for sustainability*

Since children have the positive point of view that their local marine environment is important for them, they are motivated to protect it. Environmental education with the key dimensions of education *about*, *in* and *for* the environment is the mediator through which children can learn to care for their environment. However, Hicks and Holden (2007) argued that the future is a missing dimension

from environmental education. Education for sustainability will give young people the opportunities to learn and be concerned for the current state of the planet and human responsibility for the environment in the future.

Chapter 36 of *Agenda 21* describes education as important to respond to the environment and development issues to promote sustainable development (Tilbury, 1995). It recommends reorienting education to support sustainable development. Hicks and Holden (1995) point out that educational practitioner should place a future dimension in the curriculum.

## **5.6. Conclusion**

A number of conclusions can be drawn from the findings of the study. These are now discussed:

### *The experiences*

The experiences of children appear to link to their knowledge about their local environment. Their knowledge was also established through their relationship with other people in the community. Although children have good knowledge of a particular ecosystem, it is clear that their understanding of how the ecosystem works is still limited and they have some misconceptions. Through their experiences, children learn about their local environment and this shapes their understanding of how they can live in that environment.

### *The values and attitudes*

Children have a range of values and attitudes toward the environment. The main value of the marine environment appears to be that it gives provisions such as food for them. Additionally, parts of the marine environment may also provide protection from serious marine events. The relationship with the sea also has a cultural and spiritual dimension through the ritual sea-offering ceremony which gives values to the sea as a place that communities need to respect. These ecosystem services have developed children's awareness that the marine

environments such as seagrass beds, mangrove forests and coral reefs have given benefits to them. However, poverty emerged as a barrier to people conserving their local marine environment. Since many coastal villages in Indonesia still live in poverty, the basic need for access to food has become a priority. The communities are not able to think about conservation, if they are not surviving.

There are long traditions which are still running in coastal villages where people dump their waste in the beach or the sea. These traditions are hard to change since they have been running for many years and passed from generation to generation. This results in the contradiction that although children recognize the value of their local environment as a place that needs to be respected. Some of their behavior is not respectful.

### *Sustainability*

The term sustainability is not familiar among the teachers and elders, but their comments showed they had some understanding of the concept of providing a good environment for children in the future by protecting and conserving the local marine environment. Moreover, children's concept about sustainability is very simple. They do not consider an unsustainable future. Children do not consider the environmental problems such as habitat destruction will threaten them. Their interpretation of the future might be different from that of children who live in the city who might see the world as being more complex, and that societies face various problems in the environment.

### *Environmental education and education for sustainability*

Since children believe that their local marine environments are important for them, they were willing to learn about them in the school and they were willing to know more about how they can protect them. There are clear indications that environmental education and education for sustainability are not strongly emphasized in the school curriculum. Although "Local Content" in Indonesian curriculum is a subject which has given teachers opportunities to teach about environmental education, this subject is not compulsory and only an option beside

culture and language subjects. Many teachers who lack knowledge will avoid teaching environmental education in their classroom and prefer to teach culture which is more familiar to them.

The UN Decade for Education for Sustainable Development (2005-2014) is a good moment to introduce sustainability into the curriculum. Education for sustainability should become education about, in and for the environment and address the sustainability issues. It would develop the children's capabilities to take competent action which fits with their local issues. Education for sustainability could improve children's understanding about their responsibility as a future generation to ensure that their practices benefit not only themselves but the environment.

The spirit of the UN Decade for Education for Sustainable Development is to promote and improve the quality of education by empowering educational practitioners and all stakeholders to work together, reorient the curricula by implementing local curriculum that fits with local issues, and raise public awareness. I believe that to conserve and protect the marine environment we need to not only educate the children but also educate and involve the communities as a whole.

### **5.7. Implications for practice and future research**

This study has revealed the current conceptual understandings of the children about their local marine environment and their ideas about sustainability. The implications that can be taken from this study are possibly limited as the study involved only two schools. However, many other schools show similar characteristics to those studied so the suggestions for practices and future research could be applied more widely.

Marine environmental education should not only educate children in formal school but also educate people in the communities. The coastal communities as a whole should be working together to achieve the aims of education and

conservation. Additionally, the school as a whole needs to support the implementation of marine environmental education.

### ***5.7.1. Implication for practices***

#### *Curriculum development*

The local schools should promote education for sustainability in the curriculum. As a target, children's conceptual understanding about their local marine environment and the place where they live should be considered when developing a local curriculum. Consideration needs to be given to the attitudes and values, particularly as they are affected by cultural practices. Since attitudes, values and cultural practices are shaped by a variety of contextual factors such as community traditions to dump the waste in the beach or sea, this context needs to be approached carefully.

The values and attitudes toward the marine environment should be integrated in each subject including cultural practices, such as aesthetic and health aspects, and their impact on the environment. The basic science about how the marine environment works needs to be placed in their science subject. Hands-on experiences with their local environment will help children develop both their conceptual understanding about and appreciation of the environment.

#### *Professional development*

Since teachers do not have sufficient and accurate knowledge about the local marine environment, some professional development needs to be implemented. Educational programs are offered by some non-governmental organizations and could provide this training.

Elders should be consulted when developing the curriculum, as they have knowledge and experience of the local marine environment. Children and teachers will benefit from gaining knowledge about local environment issues.

### ***5.7.2. Future research***

This thesis has argued for improved marine conservation education in primary schools in Lombok. It calls for the development of a local marine environment curriculum that fits with the local issues and models how teachers can teach marine environmental education effectively in their classroom. Future research could focus on evaluating this development and its the implementation.

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## APPENDIX A

# QUESTIONNAIRE

### Background

1. Age : .....
2. Class : .....
3. School : .....
4. Parent occupation : .....

Key :  Yes       No       Don't know

1. I go to the beach or the sea ...
  -  Everyday
  -  3 or 5 times a week
  -  Once a week
  -  Never
2. I like swimming in the sea (*circle one of the faces*)  
3. I collect shellfish from ... (*circle any of the words that apply*)
  - The beach
  - From the sea
4. I collect shellfish because ... (*circle any of the words that apply*)
  -  It's fun
  -  To eat
  -  To get some money
5. I go fishing in the sea (*circle one of the faces*)  
6. If you go fishing, why do you this? (*circle any of the words that apply*)
  -  For fun
  -  To catch fish to eat
  -  To catch fish to sell for money

7. If you go fishing, who has taught you how to do this? (*circle any of the words that apply*)

 Parents

 Other family members

 Other fishermen

 Friends

 Nobody

8. If you go fishing, what methods do you use? (*circle any of the words that apply*)

 Lines

 Nets

 Bombing

 Cyanide

 Other .....

9. If you go fishing, where do you go? (*circle any of the words that apply*)

 Seagrass beds

 Coral reefs

 Fishing platform

 Open sea

 Other .....

For the following questions, circle the face that best fits your answer:

10. I think that some people in my village use bombing  
to catch fish

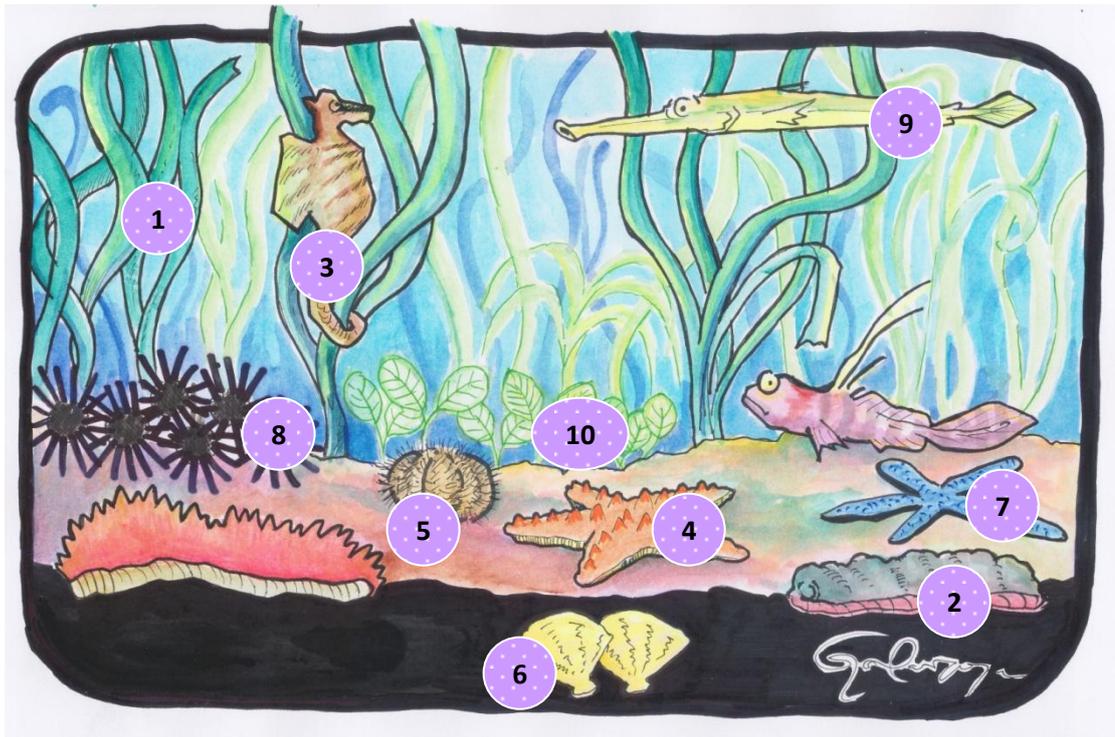


11. I think that some people from other villages use  
bombing to catch fish





LET'S GO TO THE SEAGRASS BEDS



Hand-drawing by Taufan Galaxy (2006)

Can you identify?

1. ....
2. ....
3. ....
4. ....
5. ....
6. ....
7. ....
8. ....
9. ....
10. ....

Circle one of the faces

11. I have visited seagrass beds



12. Seagrass beds are only found in Lombok



13. Seagrass has roots, stems, leaves, flowers  
and fruits.   

14. Who eats seagrass? (*circle any of the words that apply*)

-  People
-  Green turtle
-  Starfish
-  Shark
-  Dugong

16. I think seagrass is important for us   

17. I think seagrass is important for other animals   

18. I like seagrass beds   

19. I think I should learn about seagrass beds at school   

20. My daily activity can cause damage to seagrass beds  
  

21. If you know of any things that can harm seagrass beds, please write them  
in the box below:

*Circle one of the faces*

22. I would like to protect seagrass beds   

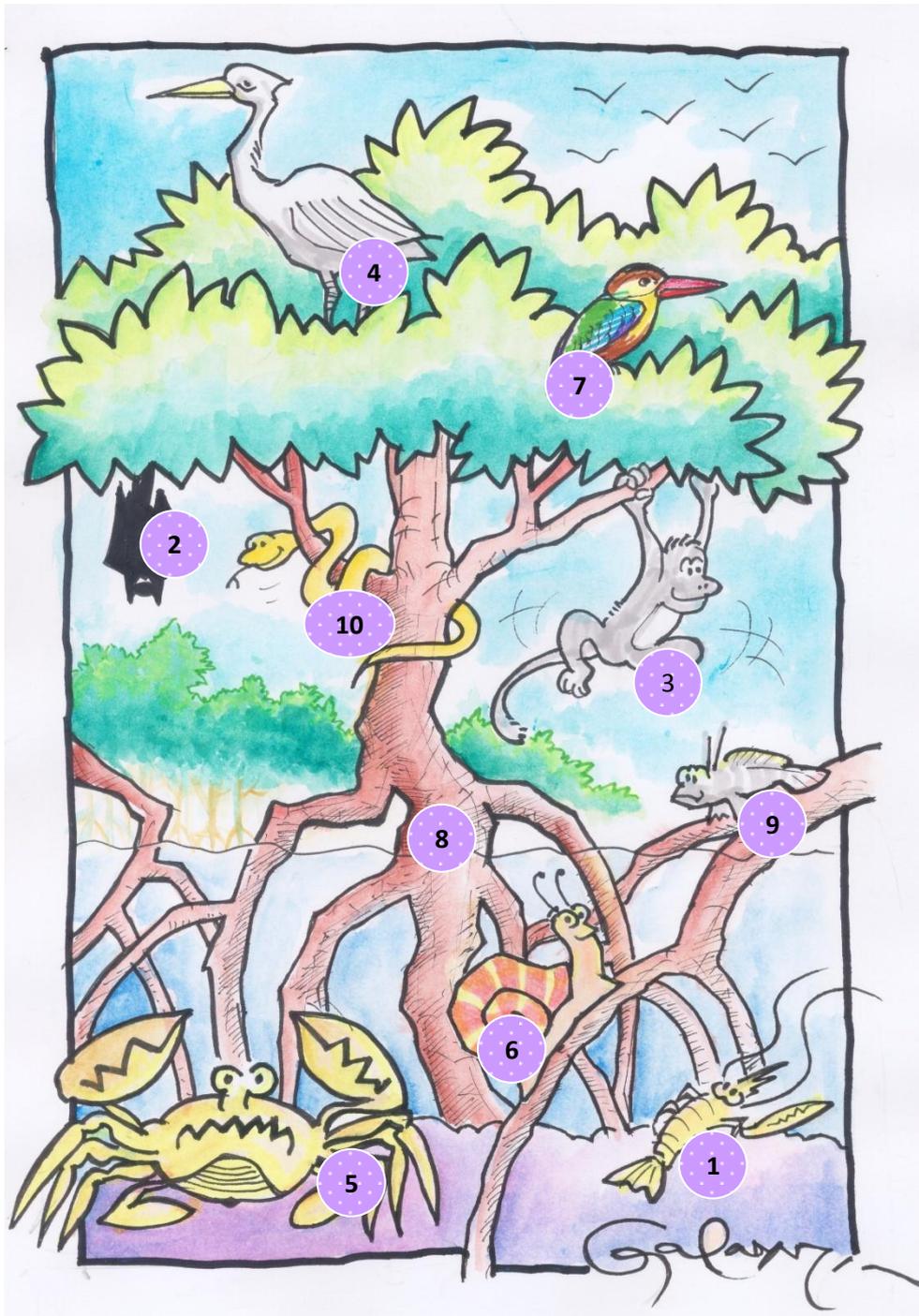
23. I can do something to help seagrass beds   

24. Tourists like to visit seagrass beds   

25. The people in my village care about  
the seagrass beds   

26. I think people need to change their behaviour  
to protect seagrass beds   

LET'S GO TO THE MANGROVE FORESTS



Hand-drawing by Taufan Galaxy (2006)

Can you identify?

1. ....
2. ....
3. ....

4. ....
5. ....
6. ....
7. ....
8. ....
9. ....
10. ....

*Circle one of the faces*

11. I have visited mangrove forests   
12. Mangrove forests are only found in Lombok   
13. Mangrove forests protect lands and islands  
from tsunamis   
14. Mangrove forests can be a filter system between the land  
and the sea   
15. Mangrove forest is a nursery area for some animals,  
such as fish   
16. Who finds food in mangrove forests? (*circle any that apply*)
  -  Birds
  -  Green turtles
  -  Tuna fish
  -  Bat
  -  Dolphin

*Circle one of the faces*

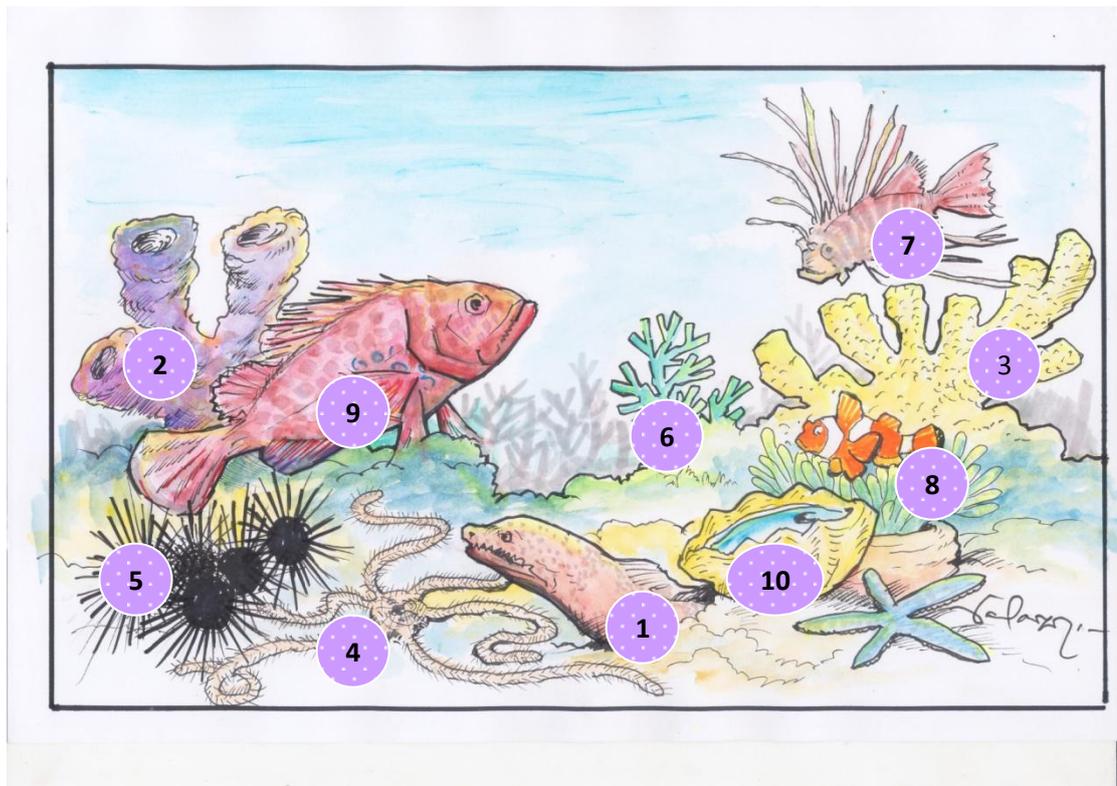
17. I like mangrove forests   
18. I think mangrove forests are important for us   
19. I think mangrove forests are important for other animals   
20. I think we should learn about mangrove forests  
at school   
27. My daily activity can cause damage to mangrove forests   

21. If you know of any things that can harm mangrove forests, please write them in the box below:

*Circle one of the faces*

- |  |   |   |   |
|--|---|---|---|
| 22. I would like to protect mangrove forests                                     |    |    |    |
| 23. I can do something to help mangrove forests                                  |    |    |    |
| 24. Tourists like to visit mangrove forests                                      |    |    |    |
| 25. The people in my village care about the<br>mangrove forests                  |  |  |  |
| 26. I think people need to change their behaviour<br>to protect mangrove forests |  |  |  |

## LET'S GO TO THE CORAL REEFS



Hand-drawing by Taufan Galaxy (2006)

Can you identify?

1. ....
2. ....
3. ....
4. ....
5. ....
6. ....
7. ....
8. ....
9. ....
10. ....

*Circle one of the faces*

11. I have visited the coral reefs



12. I have caught fish or other food at the coral reefs



- |  |   |   |   |
|--|---|---|---|
| 13. Coral reefs are only found in Indonesia  |    |    |    |
| 14. Coral reefs are a coastal ecosystem  |    |    |    |
| 15. Coral grows  |    |    |    |
| 16. There are many kinds of coral  |    |    |    |
| 17. Coral is an animal   |    |    |    |
| 18. I think coral reefs are important for us   |    |    |    |
| 19. I think coral reefs are important for other<br>animals and plants                      |    |    |    |
| 20. I think it is ok that people take coral for building<br>their house                    |    |    |    |
| 21. I think collecting coral is good   |    |    |    |
| 22. I think it is a bad idea to use dynamite to catch the fish<br>in the coral reefs       |    |    |    |
| 23. I think I should learn about coral reefs at school                                     |  |  |   |
| 24. My daily activity can cause damage to coral reefs                                      |  |  |  |
| 25. If you know of any things that can harm coral reefs, please write in the box<br>below: |   |   |   |

*Circle one of the faces*

- |   |   |   |   |
|---|---|---|---|
| 26. I would like to protect coral reefs                 |  |  |  |
| 27. I can do something to help coral reefs              |  |  |  |
| 28. Tourists like to visit coral reefs                  |  |  |  |
| 29. The people in my village care about the coral reefs |  |  |  |

30. I think people need to change their behaviour  
to protect coral reefs



**Thank you for filling the questionnaire**

## APPENDIX B

### *Children from fishing families interview*

#### Questions list:

1. What do your parents do?
2. Have you been to the sea with your parents?
3. When do you go to the sea?
4. What do you do when you go to the sea?
5. What kind of fish and other animals do your parents catch from the sea?
6. How do they catch fish?
7. Do you know of any fishermen that catch fish by bombing or using cyanide? What do you think about that?
8. What would happen if there were no fish in the sea?
9. What things from the sea do you eat?
10. What can you tell me about seagrass beds, mangrove forests and coral reefs?
11. Which is most important for you, seagrass beds, mangrove forests or coral reefs? Why?
12. Do you know of any threats that seagrass beds, mangrove forests or coral reefs face?
13. What would you think if seagrass beds were destroyed?
14. What would you think if mangrove forests were destroyed?
15. What would you think if coral reefs were destroyed?
16. Do you think marine environment is important for you? Why?
17. Do you think it is important to respect the marine environment? Why?
18. Do you have any ideas about how to protect the marine environment?
19. Do you think it is important to learn about marine conservation?
20. Does anyone teach you about the marine environment and marine conservation?
21. What do you think about the future of your village?
22. What work would you like to do in the future?
23. Is there anything else that you want to say about the marine environment and the marine conservation?

## APPENDIX C

### *Children from non-fishing families interview*

#### Questions list:

1. What your parents do?
2. Have you been to the family garden plot with your parents?
3. When do you go the sea?
4. What do you do when you go the sea?
5. How do fishermen catch fish?
6. Do you know of any fishermen that catch fish by bombing or using cyanide? What do you think about that?
7. What would happen if there were no fish in the sea?
8. What things from the sea do you eat?
9. What can you tell me about seagrass beds, mangrove forests and coral reefs?
10. Which is most important for you, seagrass beds, mangrove forests or coral reefs? Why?
11. What would you think if seagrass beds were destroyed?
12. What would you think if mangrove forests were destroyed?
13. What would you think if coral reefs were destroyed?
14. Do you think marine environment is important for you? Why?
15. Do you think it is important to respect the marine environment? Why?
16. Do you have any ideas about how to protect the marine environment?
17. Do you think it is important to learn about marine conservation?
18. Does anyone teach you about the marine environment and marine conservation?
19. What do you think about the future of your village?
20. What work would you like to do in the future?
21. Is there anything else that you want to say about the marine environment and the marine conservation?

## APPENDIX D

### *Teachers' interview*

#### Questions list:

1. What is your age?
2. What is your origin?
3. What is your background in teaching?
4. What qualifications do you have? Where did you get those?
5. How long have you taught in this school?
6. What subjects do you teach?
7. What do you know about seagrass beds, mangrove forests and coral reefs?
8. How important do you think seagrass beds, mangrove forests and coral reefs are to X village?
9. Do your students learn about the marine environment from you?  
If so, what do you teach about the marine environment?  
  
If so, how do you teach about the marine environment?  
  
If so, where do you teach about the marine environment?
10. What are some challenges in teaching about the marine environment?
11. Does anyone else teach about the marine environment in your school?
12. Do you think it is important your students learn about marine environment? Why or why not?
13. How would you feel if seagrass beds, mangrove forests and coral reefs are destroyed/disappear?
14. Have you ever heard about sustainability? What do you think about sustainability?
15. What do you think about marine conservation?
16. Can your students learn about marine conservation in subjects you teach?  
How?
17. Do you think it is important that your students know about marine conservation?

18. How and where can your students learn about marine conservation?
19. Do you have any ideas about how to look after seagrass beds, mangrove forests and coral reefs?
20. Does anyone else teach about marine conservation in your school?
21. Is there anything else you would like to say about your marine environment and marine conservation?

## APPENDIX E

### *Elders Interview*

#### Questions list:

1. What is your age?
2. Where were you born?
3. What is your origin?
4. How long have you lived in X village?
5. What is your occupation?  
How long have you been doing this?
6. What do you know about seagrass beds, mangrove forests and coral reefs?
7. From those environments, which is most important for you? Why?
8. What do mostly people take from those environments?
9. Are there any people from other villages that take from those environments in this area?
10. Have you have noticed any changes in seagrass beds, mangrove forests and coral reefs in this area over the past 10 years or over the time you have lived here?
11. Do you think these changes are good or bad?  
If good, in what way?  
  
If bad, in what way?
12. Do you go fishing? If yes, what methods do you use to catch fish?
13. What kind of fish do you catch? Why?
14. What do you think about using bombing or cyanide to catch fish?
15. What do you think about marine aquaculture?
16. Do you think aquaculture or catching fish is better? Why?
17. Do you know about any other marine ceremonies/festivals? Do you celebrate these?
18. How do you feel about these ceremonies in relation to your religion?

19. How would you feel if seagrass beds, mangrove forests or coral reefs were destroyed?
20. Have you ever heard about sustainability? If yes, what do you think about that?
21. Do you know about marine conservation?
22. Do you think it is important to teach the young generation about the marine conservation? Why/Why not?
23. What about teaching them about how to conserve the marine environment?
24. How do you think young generation can learn about their local marine environment and marine conservation?
25. Who has responsibility to teach the young generation about the local marine environment and marine conservation? What marine environment changes would you like to see in this village in the next 10 years?
26. Is there anything else you would like to say about your marine environment and marine conservation?

