The societal impact of Mangroves on the way inhabitants live in the coastal area Mangkang in Semarang, Indonesia

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Preface

You are currently reading my bachelor thesis about the societal impact of mangroves on the way the inhabitants of Mangkang, a coastal area in Semarang, live. The data necessary for this research was conducted during a four-week trip to Semarang, Indonesia. I was accompanied there by my lovely student colleagues Anne Beune, Hidde Hesseling and – for a short period of time – Fleur Kokenberg and Jolien Zweers. I want to thank them for how they helped me with my research, through giving me their help and feedback during our month together, and also afterwards, during our daily study sessions. I also want to thank each of them for the way they made this trip so memorable. We all had never been to Indonesia before, and experiencing this together has been amazing. We got to see Semarang in a whole different way; via a research lens, not a tourist lens. What I loved about Semarang is that it is not a touristic city, the people are so kind and they made us feel like celebrities with all of their attention towards us.

This research has been made possible by a few people I would like to thank. First of all, the people at the Soegijapranata Catholic University with which the Radboud University has a collaboration. These people are Mrs. Oely Sidabalok and Mr. Donny Danardono. They helped us get to Indonesia in the first place, and when we were there they helped us to get a translator, a research area and respondents. In short: everything we needed to get started. Of course, I want to thank my lovely translator Ms. Gabriela Kristiana Sudianto, who I got to call Gabby. I also want to thank Mr. Masnun for showing us the mangroves in his boat, and Mr. Agnun for introducing us to members of the community of Mangkang. And last but not least I want to thank my supervisor Martin van der Velde for his input and feedback.

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Madeloes de Win
Abstract

This research is focused on the societal impact of mangroves on the way inhabitants live in the coastal area Mangkang in Semarang, Indonesia.

Jakarta, Semarang and Surabaya and many more urbanized regions in Indonesia are vulnerable to flooding. Indonesia – alongside all other pacific rim countries – is the most vulnerable to natural disasters, because of a high concentration in population and a high frequency in natural disasters. The industrial and urban development, in combination with climate change and sea level rise, cause a growing pressure in coastal areas to protect, conserve and, when the damage is already done, restore mangroves. With mangrove areas becoming less and less dense, the survival of this important ecosystem is at risk in the long term. Education strategies, socioeconomic risk policies and effective governance structures are necessary to make sure no more mangroves are lost and to make sure that future generations can enjoy them also. The increase in wastewaters input – coming from industries, agriculture and households into the coastal area’s aquatic systems – is caused by the growth in population and rapid developments in the economy. Too often, exploitation is completely unregulated, the management system is not adequate, or enforcement is not strict enough. Often undervalued are the benefits of mangroves, or just simply not recognized.

Mangroves contribute to local livelihood security, they are very important to the shorelines of developing countries, and they have both a subsistence and commercial purpose. Coastal communities’ benefit directly from the goods and services that mangroves provide, because they can get products, and they benefit indirectly, by getting services such as protection of their fishpond and protection against coastal erosion. There are few plant communities who have attracted as much scientific attention and curiosity as mangrove forests in the tropics do. This curiosity is because of their roots and because of the unique adaptation mangroves have to a saline environment. Complementary to hard infrastructure, local communities are proposing mangrove restoration to tackle the root of the problem, namely, to prevent coastal erosion and to protect their villages from getting flooded by tidal waves. A social-ecological move will occur because mangrove restoration is a nature-based flood approach that helps communities and ecosystems prepare for and ‘live with floods’.

Most researchers look at this problem in a technical way, their measures are based on system understanding. This thesis aims to go beyond the technical to the social dimension. In order to achieve the aim of this research, the following research question is formulated: “What is the societal impact of mangroves on the way the inhabitants of the coastal area Mangkang live in Semarang, Indonesia?”

This led to the following sub questions:

- What impact do mangroves have on the daily life of the inhabitants of Mangkang?
- To what extent and how do the inhabitants of Mangkang feel safe living in a flood- and disaster-prone area?
- To what extent and how are the inhabitants of Mangkang dependent on the goods and services that mangroves provide?
- To what extent and how do the inhabitants of Mangkang see mangroves as their cultural heritage?
- To what extent and how do the inhabitants of Mangkang care about the state of the environment they live in?
It is overwhelming to see the extensive evidence there is on the impact humanity has on a wide range of natural systems. This led to a high increase in economic growth and consumption levels. Nowadays, we are in a ‘global ecological crisis’. The coastal area is vulnerable to anthropogenic (originating in human activity) and environmental (influenced by economic production sectors and consumption patterns) pressures because of their low elevation and geological composition. But which humans, or which agents or structures, have brought us this Anthropocene era which has caused such a societal impact? With humanity changing nature, an agent is changing its structure. Structuration is a process, in which agents reproduce or change structures, it is a dynamic process.

This research is qualitative, as well as inductive. In order to gather data from Mangkang, interviews were held. The interviews were semi-structured and conducted between April 1st and April 16th. The fieldwork, which contained 7 expert interviews, 17 street interviews and several observations – were used in answering the sub-questions and thus the main research question. The interviews were conducted with the help of an interpreter. The research area is Mangkang because mangroves grow in this coastal area of Semarang and this area is occasionally hit by tidal floods. What also makes this place an interesting place to do research, is that it used to have hundreds of mangroves, until a lot of them were cut in 1998.

Societal impact is about the assessment of social, cultural, environmental and economic effects from research results or outcome of publicly funded research. In this research, the social dimension is specified to the feelings of safety of the inhabitants of Mangkang. The focus is on subjective safety and thus on how individuals perceive and experience their safety. The inhabitants of Mangkang have tried to build a seawall to protect them from floods, but stopped when the incentives stopped coming. Nowadays, the government is planning on building a toll road between Semarang and Demak, functioning as both a Sea Highway and a seawall. The economic dimension is specified to the goods and services that mangroves provide. The goods and services that people can get from mangroves are for fuel, construction, fishing, textiles, foods and drinks, domestic, agricultural, medical and miscellaneous. When implementing ecotourism in a mangrove area, it should bring benefit to the coastal community and it should motivate them to care for and maintain mangroves. The cultural dimension is specified to cultural heritage and if the inhabitants of Mangkang see mangroves as their cultural heritage and if they feel responsible for the conservation of mangroves. Tourism is one of the drivers for cultural exchange. It provides a personal experience, not only with what has survived from the past, but it also gives a glance into the life of others. Ecotourism is on the rise, because the economic characteristics of the heritage are captured, thus providing funding for conserving the heritage while also educating the visitors. The environmental dimension is specified to the awareness of people about the environment they live in and how they feel about the future. Mangkang should be ecologically sensitive, economically viable and culturally appropriate.

In conclusion it can be said that there was a clear distinction between the people interviewed that were involved with mangroves and the ones that were not. The people interviewed involved with mangroves – as activist, expert or when dependent on their goods and services – cared a lot about mangroves, while the ones not involved with mangroves most of the time knew nothing about them and never visited them, because they were too busy with their job as a laborer. Here lies the problem of mangrove conservation: most people do not have the luxury to focus on long-term problems, because they have to focus on making enough money to provide food for tomorrow. This has to change first, in order for people to be able to really care for mangroves.
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Chapter 1: Introduction

1.1. Introduction

This research will be focused on the societal impact of mangroves on the way inhabitants live in the coastal area Mangkang in Semarang, Indonesia. Jakarta, Semarang and Surabaya and many more urbanized regions in Indonesia are vulnerable to flooding. The urgency of this situation is acknowledged by the government and flood-control infrastructure is constructed. The goal of these plans is to resist flooding. The total world population is growing at a fast rate. Semarang is the fifth most populous city in Indonesia. Indonesia - like most developing countries - has seen a tremendous increase in population. In 2017, the Worldbank stated that in 2025, 68% of Indonesia’s population will live in cities (United Nations, 2014). Coastal erosion reaches 745 km of the coast of Java, which is 44% of the coastline (Hadi, 2018). The study of Williams et al (2017:6) underpinned the importance of sufficient coastal area management, because within 25 km of the coastline, 1.4 billion people live, which accounts for 20% of the world population. Without sufficient coastal management, these people are in the danger of getting flooded.

More than 200,000 km² was once covered by mangrove forest in the (sub)tropical coastal areas. 1 to 2% is disappearing per year worldwide, in almost every country that has mangroves. Mangroves are decreasing in density even faster in developing countries, but this is where more than 90% of the mangrove population is located. Mangroves are disappearing because of urbanization, aquaculture, coastal landfill and because of the effects of pollution and upstream land use. With mangrove areas becoming less and less dense, the survival of this important ecosystem is at risk in the long term. Coastal communities protected by mangroves will then lose access to their source of food, timber, medicines and chemicals (Duke et al. 2007).

Nowadays, it is accepted by a broader public that climate change is happening. This has been happening since the mid-eighteenth century. The debate on who is to blame – and particularly if human activity is to blame – is often fierce. The nature of climate change is that the concentration of greenhouse gases in the atmosphere has increased, that the global temperature has risen, as well as the sea level. These will likely continue to do so in the future. And then there is also the effect of climate change on the frequency and pattern of rainfall. How does this effect mangroves? The range of temperatures mangroves experiences on the daily basis can amount up to 20 degrees, so it seems unlikely that the specie will suffer too much in productivity. Their geographical distribution may however be affected (Hogarth, 1999).

The industrial and urban development, in combination with climate change and sea level rise, cause a growing pressure in coastal areas to protect, conserve and, when the damage is already done, restore mangroves. Education strategies, socioeconomic risk policies and effective governance structures are necessary to make sure no more mangroves are lost and to make sure that future generations can enjoy them also (Duke et al. 2007). Local communities are proposing mangrove restoration to tackle the root of the problem, namely, to prevent coastal erosion and to protect their villages from getting flooded by tidal waves. A social-ecological move will occur because mangrove restoration is a nature-based flood approach that helps communities and ecosystems prepare for and ‘live with floods’ (Abidin et al., 2012; Aerts & Ward, 2016; Marfai & King, 2008).

The motivation for this thesis came when reading about the building with nature initiative. The building with nature initiative – by multiple publicly funded organisations like the Indonesian Ministries of Marine Affairs and Fisheries and Public Works and Housing, the German Federal Ministry for the Environment, TU Delft and Wageningen University & Research, and multiple privately funded organisations like Ecoshape, Wetlands International and Witteveen+Bos – has as
goal to create a coastline that is stable and has reduced erosion at a length of 20 kilometres in Demak District. Demak is a city close to Semarang. In order to do this, they made bio-right contracts with 10 community groups that represented 300 villagers. The villagers will sustain the mangroves themselves and will implement a sustainable aquaculture in order to revitalise their livelihood (Building with Nature, 2018). The aim of this paper is to go beyond the technocratic side of this story, and to the social side. This, because the planting of mangroves has a societal impact on the day-to-day lives of the coastal area inhabitants.

1.2. Project framework

The coastline of Java has to deal with a lot of factors nowadays. It has a fast-growing population and there are many developments in agriculture. Semarang is a growing economic corridor and is at the intersection of a dynamic water system from upland to lowland and from east to west (Bunt, & Beagen, 2019). The coastal area is vulnerable to anthropogenic (originating in human activity) and environmental (influenced by economic production sectors and consumption patterns) pressures because of their low elevation and geological composition (Ecoshape, 2017). Kreimer (2011) stated that Indonesia – alongside all other pacific rim countries – is the most vulnerable to natural disasters, because of a high concentration in population and a high frequency in natural disasters. The combination of land subsidence and climate change (and the rising of the sea level because of it) causes continuous flooding events and massive coastal erosion.

At every government level (national and local) the urgency of this problem is acknowledged. In reaction, large-scale flood control infrastructure such as dams, seawalls, levees and storm water retention channelization is installed. These all aim to prevent floods entirely. While these are good solutions, they are not adequate on their own, scholars have stressed. This, first of all, because they often impact natural habitats in a bad way, like the loss of ecosystem functions and services. Secondly, flood risks might even be more common in the long term because of hard infrastructure – especially in the face of climate change (Liao, 2012; Smits et al., 2006; van Wesenbeeck et al., 2014). Thirdly, hard infrastructure costs more planning, construction and investments maintenance wise (Jonkman et al., 2013).

Complementary to hard infrastructure, local communities in the coastal areas of Java are initiating pilot projects for mangrove restoration. These projects simultaneously try to prevent coastal erosion and tackle the root of the problem. Therefore, hard infrastructure and nature-based solutions can go hand in hand (Barbier et al., 2008; Van Wesenbeeck et al., 2017a). Mangroves often form dense forests in the intertidal muddy coastal area. This is extraordinary, because the intertidal coastal area is often quite hostile. With its wave action, high salinity, and fluctuating water levels, low oxygen concentrations in the water and frequently high temperatures; few species survive. Only a few species survive there; one of them is the mangrove forest. The roots of mangroves stabilize the soil and create a habitat for numerous other species, for example fish, shrimp and crab (Hogarth, 1999).

According to Pernetta (1993), the most mangrove forests are based and distributed in the tropical and sub-tropical regions. There they are very important to the shorelines of developing countries, and they have both a subsistence and commercial purpose. Mangroves contribute to local livelihood security, because in most cases, local communities are dependent on them in terms of the goods and services that mangroves provide. Coastal communities’ benefit in many ways from the goods and services that mangroves provide. They benefit directly, because they can get products such as timber and fuelwood. And they also benefit indirectly, by getting services such as protection of their fishpond and protection against coastal erosion (Hogarth, 1999). Mangroves thus help build an
adaptive capacity for both the ecosystems in coastal areas, as well as local communities in those areas. The local communities are thus encouraged and prepared to ‘live with floods’. A move towards socio-ecological resilience is supported this way (Adger et al., 2005; Gunderson, 2010).

This has a societal impact on the livelihood of people. The societal impact is about the assessment of social, cultural, environmental and economic effects from research results or outcome of publicly funded research (Bornmann, 2013). Livelihood contains a wide range of activities, for example the access to resources, the dealing with risks and the managing of social networks and relationships within a household, community or city (Beall, 1999). Next to a social impact on the people living in these dangerous coastal eroded areas, the situation also has an economic consequence. Transportation routes are blocked, there is a loss of land for agriculture and aquaculture and the coasts for repairing the infrastructure over and over again are very high (Ecoshape).

The main reasons for coastal erosion are first of all the removal of the mangrove belts. This happened for the development of aquaculture and because mangrove forests were in the past viewed as economically unproductive and have thus been cut down and have been used for their timber (Pernetta, 1993). The second reason is the construction of infrastructure at the coast, which disturbs the sediment build-up. Lastly groundwater extraction caused the coastal erosion, because it causes land subsidence (Ecoshape, 2017). The importance of mangroves has been recognised since the Indian Ocean tsunami of 2004, when the consequences of cutting down mangroves became visible (Ecoshape, 2016).

The construction of hard infrastructure seems a good solution to the problem of coastal erosion, but this is not a solution for the entire coast of Java. This will not work in soft muddy soils. Plus, the (maintenance) costs are high. Mangroves could provide a solution here, because they can put a halt to erosion and restore the sedimentation process. Mangroves do not grow below sea level, so in order to let them grow, a construction has to be built. This happens with permeable bamboo and brushwood dams which can be seen in the figure below. The Mangrove greenbelt that grows on this construction protects the hinterland from the impact of the waves, while it at the same times creates a good living environment for (shell)fish and shrimp (Ecoshape, 2017).

Figure 1 & 2: the construction on which the mangroves grow (de Win, 2019)
1.3. Relevance

1.3.1. Scientific relevance

There are few plant communities who have attracted as much scientific attention and curiosity as mangrove forests in the tropics do. The Chronicle of Nearchus of 325 BC is believed to be the first written account of mangroves. This curiosity is because of their roots and because of the unique adaptation mangroves have to a saline environment. Mangroves only have a few direct uses, which is probably why there is a historical ambivalence concerning their value. The earliest writings about the unique nature of mangroves are from 1888, in which was written about ‘building islands’ and ‘extending shorelines’ (Lugo & Snedaker, 1974).

Most researchers look at this problem in a technical way, their measures are based on system understanding. This thesis aims to go beyond the technical to the social dimension. The outcome of this research could be used by policymakers to get a better understanding of the societal impact of mangroves on the people living in coastal eroded areas in Semarang. Understanding the community and people’s response

The study of Esteban et al (2017:78) on the awareness of coastal flooding in Jakarta says that to improve resilience, not only dykes have to be constructed, but also mangroves must be planted. Zagonari (2008:803) in his study suggests that an integrated approach is better for achieving coastal quality than a non-integrated approach. When dealing with coastal management all stakeholders should be involved and the focus should be local, not national, and on users rather than on uses.

David Romero Manrique de Lara, Sera Corral. 2017 (160-161) noted that an integrated approach identifies the root of the problem and the impact of an unsustainability issue while at the same time exploring the measures from their own point of view. When a dialog is facilitated, local communities and public authorities can collaborate and work as a team to reach solutions. A sustainable project is ensured this way, because it than has the support of all stakeholders.

1.3.2. Societal relevance

Mangroves can be seen as the ‘rain forests of the sea’. Millions of lives in more than 120 nation states in the tropics are impacted by mangroves, as source of raw material, food and recreation. They have been impacting lives for millennia. Nowadays, with humanity aware of global warming and its effects on climate change it is crucial to realize that one of those effects; sea level rise, places mangroves at the front line of such change. More than ever, knowledge about mangroves is vital (Tomlinson, 2016). But, mangroves have been exploited in the last three decades. And in such a pace that the concern for them has reached a global level. The lives of millions of lives whose livelihood depends on mangroves have been displaced (Warne, 2012).

This research can be used to analyze and understand local residents in coastal areas. The knowledge conducted in this research can help the local government, for example, in understanding the societal impact on the inhabitants of coastal areas of mangroves. Abreu et al (2017:17) underpins the importance of a bridge between traditional and scientific knowledge for finding solutions to social and environmental problems. The view of a member of the community who experiences the problem is crucial for really understanding the problem and in order to find an adequate solution.

Semarang is also not the only place where a problem like this exists. The outcome of this research could be used in other countries where mangroves can grow and where coastal erosion is a problem, like countries in South-eastern Asia, for example the Indonesia, Filipins, Thailand and Vietnam (Richards and Friess, 2016).
1.4. Research objective

The objective of this research is to gain insight in the societal impact of mangroves on the way inhabitants live in the coastal area Mangkang in Semarang, Indonesia. This done by dividing societal impact into four sub dimensions: the social dimension, the economical dimension, the cultural dimension and the environmental dimension. The social dimension is about how safe the inhabitants feel in Mangkang. The economical dimension is about the dependency of the inhabitants of Mangkang on the goods and services that mangroves provide. The cultural dimension is about if the inhabitants of Mangkang see mangroves as their cultural heritage and if they feel responsible for the restoration of them. The environmental dimension is about the awareness of the inhabitants of Mangkang regarding the state their environment is in.

Just like in every research, the issue is to obtain new knowledge (Vennix, 1997). Goal is to research the social side of a technocratic story. What does or can the planting of Mangroves mean to people in their day-to-day life? This research will be practically oriented, that is its main focus, but every research builds on the shoulders of giants, so it is also theoretically oriented.

1.5. Research question

The critical literary review let to the following question:

“What is the societal impact of mangroves on the way the inhabitants of the coastal area Mangkang live in Semarang, Indonesia?”

This led to the following sub questions:

- What impact do mangroves have on the daily life of the inhabitants of Mangkang?
- To what extent and how do the inhabitants of Mangkang feel safe living in a flood- and disaster-prone area?
- To what extent and how are the inhabitants of Mangkang dependent on the goods and services that mangroves provide?
- To what extent and how do the inhabitants of Mangkang see mangroves as their cultural heritage?
- To what extent and how do the inhabitants of Mangkang care about the state of the environment they live in?
Chapter 2: Theoretical framework

This chapter deals with the theories used in this research. Theories and ideas related to this research are explained in this research. This, to close the gap between the research question of this research and the empirical research done in Mangkang. First, a couple of key concepts are elaborated on and then the structure agency theory of Giddens is elaborated on.

2.1. The Anthropocene: the agent is changing its structure

It is overwhelming to see the extensive evidence there is on the impact humanity has on a wide range of natural systems. There is a growing impact on every corner of the planet and greenhouse-gas emissions are ever increasing, resulting in climate change, the rising of the sea level and other environmental disasters, like biodiversity loss. Our ecosystems and ways of land-use have been very humanised (Vitousk, Mooney, Lubchenco, & Melillo, 1997). Since the 1950s – after the second World War - a ‘Great Acceleration’ occurred in terms of resource use, agricultural intensity and economic output. This led to a high increase in economic growth and consumption levels. Nowadays, we are in a ‘global ecological crisis’ (Baskin, 2015).

The Anthropocene is the name for this age of humankind. When you talk about the Anthropocene, you talk about a whole different view on the relationship between mankind and nature. Mankind is dominant and Earth-shaping, and we have entered a new geological era. It puts animal (humanity) above animal, and only accepts a God above us. The Anthropocene was initially promoted by physical- and earth science scholars who stated that we moved beyond the 12000-year-old Holocene (Crutzen and Stoermer, 2000; Crutzen, 2002). The reason we moved beyond would be that our impact on the Earth now includes altering biochemical cycles, for example carbon and nitrogen. Another reason is the modifying of terrestrial water cycles, for example our changes in land-use and river flows. And lastly our increasing extinction rates, which haven’t been higher since the dinosaurs (Baskin, 2015). Crutzen describes it as the following: “The long-held barriers between nature and culture are breaking down. It’s no longer us against ‘Nature’. Instead, it’s we who decide what nature is and what it will be. . . . In this new era, nature is us“ (Crutzen and Schwägerl, 2011). Lynas even states that “Nature no longer runs the Earth. We do” (2011: 8). It all comes down to this: The Age of Man.

You can look at the Anthropocene as a new era, but also as just a new name for the Holocene. According to Crist (2013), we suffer from a ‘human supremacy complex’ . But nevertheless, it is a particular way of understanding the world. It is a paradigm, an ideology (Baskin, 2015). Kolbert (2011) reported that Crutzen said that the value of the Anthropocene is not in changing the geology textbook, it is about a ‘warning to the world’. It does not have to be acknowledged by all to be of global impact. But the Age of Man can protect the world around him, alongside dominating it. We are our past, we are our present and we can transform the future. This can go beyond ‘ecological modernisation’ (Mol and Sonnenfeld, 2000) to governing and managing the planet (Baskin, 2015).

The word ‘nature’ might be the most complex word in the English language, because the amount of human history it contains is usually unnoticed (Williams, 1980).

Responding to the challenges of the Anthropocene should contain experts who guide the management of the earth and its systems, using advanced large-scale technology. A sense of emergency should emerge with responding. The planet is at risk, and there is no planet B. The sea level is rising, and seascapes and landscapes are being transformed. Global management is necessary (Baskin, 2015). One of the most prominent challenges has been the development trajectories in China, India, Brazil, South Africa and Indonesia. The OECD countries drove the Great Acceleration of
1945-2000, meaning a small part of the world’s population, nowadays it is much more democratic (Steffen, Grinevald, Crutzen, & McNeill, 2011).

But which humans, or which agents or structures, have brought us this Anthropocene era which has caused such a societal impact? With humanity changing nature, an agent is changing its structure. Structuration is a process, in which agents reproduce or change structures, it is a dynamic process.

The theory of structuration is not about the individual experience of an actor, nor is it about societal totality. It is about social practices that are ordered across space and time. Like more self-producing things in nature, the social activities of humans are recursive. This means that the conditions for these activities are reproduced by agents. The concept of time-space is one of the bases of structuration, and this begins from temporality, or: ‘history’. When analysing the structuration of social systems, you have to study the modes in the systems of actors who make rules are produced and reproduced in interaction (Giddens, 1984).

The duality of structure is very important to the idea of structuration. Agents and structures are not independent from each other. In this idea of duality, both medium and outcome are the structural properties of social systems. Structure is more ‘internal’ than ‘external’ than one might think, because it has traces in memory and in social practices. Structure is also always constraining and enabling. But actors cannot control the stretching away in space and time of structured properties of social systems. There is also a possibility that actors reify those systems with their own theories of social systems (Giddens, 1984).

‘Action’ is not just ‘acts’ put together; it is about lived through experiences. Action is a continuous flow and reflexive monitoring is crucial to control the body in the day to day life. You are the author of many things you do, but also the author of many things you do not intend, but none the less do. Agency is about the capability of doing what you intended to do; therefore, agency implies power. An Agent is someone who has an effect, or who exerts power. ‘Acting otherwise’ means intervening in the world, and thereby influencing a process or state of affairs. So, to be an agent, you have to have a range of causal powers, including being of influence. Action depends upon people who can make a difference to a pre-existing state of affairs (Giddens, 1984).

Mangroves belong to one of the most endangered ecosystems of the world. Mangroves are estimated to have decreased in population since the ’80 by 30-50% (Field et al, 1998). The main endangerment for mangroves is men, the agent is changing its structure. Mangroves have been cut for the purpose of aqua- and agriculture (for example rice fields, coconut- and oil palm plantations), commercial logging, the production of firewood and charcoal, urban expansion and coastal development. Aquaculture, shrimp in specific, are the biggest tread to mangroves. This is in particular the case in countries in South-eastern Asia, like the Indonesia, Filipins, Thailand and Vietnam (Richards and Friess, 2016). In Mangkang, there is a clear turning point visible in history. This was in the year 1998. Hundreds of mangroves were cut, because people were uneducated about mangroves and did not know why they should not be cut down. In the following years, this became clear. Mangkang struggled with floods and land subsidence. During extensive education, being done by the government and activists passionate about the environment, beginning with mangroves, a shift occurred in the thinking of the inhabitants of Mangkang. More and more people started to see the importance of mangroves. And slowly but steady more mangroves were being planted. So, the agent is ever changing its structure.
2.2. Societal impact
In this research, societal impact is divided into four dimensions: the social-, economic-, cultural- and environmental dimension.

2.2.1. Social dimension
In this research, the social dimension is specified to the feelings of safety of the inhabitants of Mangkang. So, to what extent do the inhabitants of Mangkang feel safe living in a flood- and disaster-prone area? When connecting social to mangroves in this research, it became clear that the impact mangroves have on coastal communities is that they protect them from tidal floods and erosion. The feeling of safety can improve in such a case.

Safety is a broad concept. In this research, safety is described as the presence of a certain degree of order and where people's health, life and belongings are protected against acute or imminent hazard. Unsafety is everything that violates this (Van WinsumWestra and De Boer, 2004). According to Maas et al. (2009), People's well-being, health and overall quality of life is dependent on feeling safe. Within safety, a distinction must be made between objective and subjective safety. Objective safety is derived from facts and figures and subjective safety is derived from how individuals perceive and experience their safety. In this research, the focus will be on subjective safety. Subjective safety influences people's behavior and makes people avoid places they find unsafe. Subjective or perceived safety is about the way in which visitors experience safety, about the visitors' interpretation of the safety situation and the 'consequences' of insecurity. The perception of safety and the feelings of (in) safety of the inhabitants form the basis for this (Van WinsumWestra and De Boer, 2004).

2.2.2. Economic dimension
The economic dimension is in this research specified to the goods and services that mangroves provide. When connecting the economic dimension to mangroves, the question rose as to how people could get financial benefit out of mangroves. The goods and services that people can get from mangroves are, according to Hogarth (1999), for fuel, construction, fishing, textiles, foods and drinks, domestic, agricultural, medical and miscellaneous.

When implementing ecotourism in a mangrove area, it should bring benefit to the coastal community and it should motivate them to care for and maintain mangroves. The collaboration of local cooperators, such as conservationists, representatives, property owners, policy makers, tourism operators, site managers and those preparing plans for national development is crucial in achieving a tourism industry that is sustainable and which enhances the protection of mangroves, in order for future generation to enjoy them also (ICOMOS, 2002).

2.2.3. Cultural dimension
The cultural dimension is in this research specified to cultural heritage. When connecting the cultural dimension to mangroves, the question rose as to if the inhabitants of Mangkang see mangroves as their cultural heritage and if they felt responsible for the conservation of mangroves.

According to ICOMOS (2002), cultural heritage belongs to all people. We all have the responsibility to appreciate, conserve and understand what was given to us by previous generations. The term heritage includes cultural values but could also include natural values. Historic places, landscapes, built environments, (art)collections, biodiversity, living experiences and knowledge and past and continuing practices could all be heritage. Cultural heritage is the accumulation of historic developments which have formed multiple national, regional and local identities which are integrated in modern life. It is dynamic, ever changing and open for growth. All cultural heritage is
unique, irreplaceable and functions as the foundation for future development, today and in the future. With increasing globalization nowadays, the conservation, protection, presentation and interpretation of cultural heritage is more important than ever and is an important challenge for all. But, the management of a cultural heritage is usually the responsibility of the local community. The significance of the heritage should be communicated to the host community, and its visitors, as is should be within the internationally recognized framework and standards. The access to cultural heritage is a right, as well as a privilege and it is accompanied with a duty of respect and interest for the heritage, as well as for the community that takes care of it and for the landscape and culture in which it is formed and evolved.

Tourism is one of the drivers for cultural exchange. It provides a personal experience, not only with what has survived from the past, but it also gives a glance into the life of others. Ecotourism is on the rise, because the economic characteristics of the heritage are captured, thus providing funding for conserving the heritage. This combined with also educating the community and visitors and influencing policy makes that it is an essential part of both local, regional and national economies. Ecotourism can be an important factor in the development of an area, if managed successfully. Poorly managed ecotourism sites can threaten the characteristics a cultural heritage has. This has a negative effect on the local community and on the visitors (ICOMOS, 2002).

2.2.4. Environmental dimension

The environmental dimension in this research specified to the awareness of people about the environment they live in. When connecting the environmental dimension and mangroves, the question rose as to how aware the inhabitants of Mangkang are of the state of their environment, and how they feel about the future.

Following the Pressure-Condition-Response model, the state of the environment can be assessed based on three indicators. These indicators are the basis of empirical systems assessing the environment. The focus lies on the status and the trends noticeable in the environment. The first indicator is pressure (P), meaning the anthropogenic threats – for example pollution, water extraction and land clearance – that the environment faces. The second indicator is condition (C), meaning the state of the environment, as assessed by traditional assessment systems of scientists. The third indicator is response (R), meaning the reaction of the society to fix the problem. This may include public awareness campaigns, policy development or other non-scientific sources of information. So, where the pressure and condition indicators are based on scientific evidence, the response indicator includes management, socio-economic and policy elements. Subsequently, scientists tend to be not so good with the response indicator. The PCR model implies a causality link: pressures (P) will decline condition (C), but the response (R) should improve the pressure. A feedback loop appears with the inclusion of response. These causal links are relatively easy to see when looking at a single case, but are harder when they are concerning generalized problems, such as coastal erosion, which has many specific causes (Fairweather, 1999).
2.3. Conceptual model

The conceptual model below combines all discussed above in a simplistic and clear way.

This research will be focused on the societal impact of mangroves on the way inhabitants live in the coastal area Mangkang in Semarang, Indonesia. The growth in the world population is causing people to move to the city. In Semarang, next to urbanization, coastal erosion and land subsidence are also occurring. Coastal erosion and land subsidence cause land degradation. In intervention is held by restoring mangroves. This, to prevent land degradation. Land degradation has a societal impact on the inhabitants of the coastal eroded areas of Semarang. An intervention is taking place in the form of the restoration of mangroves. Societal impact can be divided into four categories, namely: social, cultural, economic and environmental. The social domain is about acceptance of the situation, the feelings of safety of the people living in coastal eroded areas and adaptation to the problem. The cultural domain is about cultural heritage and the feelings of responsibility towards the conservation of mangroves. The economical domain is about the dependency of people on the goods and services that mangroves provide. Last but not least, the environmental domain is about the awareness of people about the state of their environment.
Chapter 3: Methodology

This chapter contains the methods used to gather the data and analyze it. The answers to why a certain method is chosen and used in this research is explained and legitimated in this chapter. First the research strategy is elaborated. Then, the research material and thus the method used per sub-question.

3.1 Research strategy

In this thesis it is researched what the societal impact of mangroves is on the way the inhabitants of the coastal area Mangkang live in Semarang, Indonesia. This subchapter of the methodological chapter is elaborating on the strategy that is used to gather data, what kind of data is gathered, how this data is gathered, among who this data is gathered and how the data is analyzed.

Verschuren en Doorewaard (2007) describe five research strategies; survey, experiment, case study, grounded theory approach and desk research. In this research the single instrumental case study with semi-structured interviews method is chosen. This, because here ‘the researcher focuses on an issue or concern, and then selects one bounded case to illustrate this issue’ (Stake, 1995). The issue here is the societal impact of mangroves and the one bounded case selected is Mangkang.

This research is qualitative, as well as inductive. This research is qualitative, because through conducting interviews the answer to what the societal impact of mangroves on the inhabitants of the coastal area Mangkang live in Semarang, Indonesia. This research is inductive, because the outcome of the case study is generalised. It was not possible to interview every inhabitant of Mangkang, because of limited time.

In this research, first, a literature study is done. Data is sought, read, summarized and interpreted regarding Semarang – especially on sub-district Mangkang – and on mangroves and their societal impact. Data is also collected about theories. This way, a background of the problem is described. The literature is collected using the ‘snowball method’, this means looking for useful literature in the references of other literature.

Secondly, the answer to the research question is sought by conducting semi-structured interviews with inhabitants of Mangkang and other experts. A semi-structured interview is chosen, because it gives the interviewee the change to tell stories that might be relevant for the research, but where the researcher has not thought of. But the interview must stay on topic, so a list of subjects is preferable. In this research, pollution by big companies was the topic that came to light, due to the semi-structured interview method.

In this research 7 experts and 17 street-interviews were conducted. The experts were 6 activists living in the neighborhood and 1 employee at the global non-profit organization Wetlands International Indonesia. The street-interviews were conducted among 7 inhabitants of Mangkang who were involved with mangroves, and 10 inhabitants who were not. The 7 inhabitants who were involved with mangroves are not randomly sampled but found with the help of an activist and expert who was also interviewed. The 10 inhabitants who are not involved with mangroves are randomly sampled. All inhabitants interviewed were adults above the age of 18 years old and have lived in Mangkang for a longer period of time, most all of their life. This is a limitation of the research: the sample of the population is not completely random, resulting in a relatively lot of people interviewed who are involved with mangroves, while most inhabitants of Mangkang are not involved with mangroves.
Thirdly, the conducted data is analyzed and interpreted using Atlas.Ti. All interviews are transcribed, resulting in 70 pages of transcript. The Indonesian speaking parts of the interview are left out of the transcript. The collected data is coded and categorized in groups, a group was made for each dimension of this research and thus all sub-questions of this research. This, to help analyze and summarize the data. Coding is meant to capture the essence of the gathered data; this is done in an interpretive process. The codes used in this research were not set beforehand, but open coded along the way, this to keep an open mind while coding the transcript. A code was also made for quotes, which are used to further underpin explanations in Chapter 4: Research results & Analysis. A list of the codes used in this research can be found in Appendix III.

The people to interview were sought using a ‘gateway’ person. A ‘gateway’ person is someone that knows people in the field and can help you collect interviewees. Our contact person in Semarang was our first gateway person. At the beginning of our time in Semarang, we pitched our research subject and proposal to a few members of the Soegijapranata Catholic University of Semarang. They helped us find our research area and recommended us NGOs to interview. Her father having two fisherman/activist friends in the area, Gabby the interpreter became the second gateway person. One of the fishermen became the second gateway person, introducing us to more expert activists in the area. For the street interviews he also introduced us to people he knew in Mangkang, but the view became too one-sided. Looking at the data, it seemed like everyone in Mangkang was involved with- and cared about mangroves. That is why the rest of the street interviews were randomly sampled, and none of those people were involved with mangroves.

The research area is Mangkang because mangroves grow in this coastal area of Semarang and this area is occasionally hit by tidal floods. What also makes this place an interesting place to do research, is that it used to have hundreds of mangroves, until a lot of them were cut in 1998.

The interviews were conducted with the help of an interpreter, because the inhabitants of Mangkang do not speak English. This is also a limitation of the research; the language barrier. The use of an interpreter was necessary, because the interviewer and interviewees spoke different languages, but the interpreter can, for example, forget parts to translate or misinterpret words causing the danger of a different message coming across than intended by the interviewee.

The interview guide for the street-interviews is 6 questions long. The first question is an introduction question in which the interviewee is asked to tell something about him- or herself. The next 5 questions are directly linked to the different sub-questions of this research. The second question asks the interviewee what impact mangroves have on his or her life. The next four questions are linked to the dimensions in which societal impact is divided and are also thus linked to sub-question 2-5; social dimension, economic dimension, cultural dimension and environmental dimension. The interview guide for street-interviews can be found in Appendix I.

The interview guide for the expert interviews is 10 questions long. The interview guide for the expert interviews is longer than the interview guide for street-interviews, because the interview with experts was set to be 1-1,5 hour, instead of the 10-30 minutes for a street interview. Because most experts interviewed live in Mangkang, the same questions were asked as when conducting the street interviews, but more were added. A question about flooding, ecotourism, hard infrastructure (such as dams, dykes, seawalls) and the future were added. During the interviews a lot of interviewees spoke about the ongoing pollution by big industries, so a question about this phenomenon was added in later interviews, if the interviewee did not bring it up him- or herself. The interview guide for experts can be found in Appendix I.
The fieldwork was conducted in the period between April 1\textsuperscript{st} and April 16\textsuperscript{th} in Mangkang in Semarang, Indonesia. This resulted in 24 interviews. This is also a limitation of the research; limited time. This time was used finding interviewees, preparing interviews, 4 days of interviewing and 2 times observing the mangroves. The observing of mangroves happened during a boat ride, provided by one of the interviewees and during two walks in the area.

3.2 Linking questions to data

This subchapter of the methodological chapter is elaborating on the methods used to gather data per sub-question. This in order to answer the main question: "\textbf{What is the societal impact of mangroves on the way the inhabitants of the coastal area Mangkang live in Semarang, Indonesia?}". Answered per sub-question is which sources provided this data.

\textit{Sub-question 1: What impact do mangroves have on the daily life of the inhabitants of Mangkang?}

This question is answered using the outcome of the semi-structured interviews in Mangkang and using the outcome of the literature study. The impact that mangroves have on the daily life of people is described by the following authors: Abidin et al. (2012), Aerts & Ward (2016) and Marfai & King (2008), Hogarth (1999), Duke et al. (2007), Dsikowitzky et al. (2011).

\textit{Sub-question 2: Do the inhabitants of Mangkang feel safe living in a flood- and disaster-prone area?}

This question is answered using the outcome of the literature study and the outcome of the semi-structured interviews in Mangkang. The information about the Sea Highway is derived from Agustine (2018) of PWC Indonesia (PricewaterhouseCoopers International Limited, a separate and independent legal entity). During the interviews, some people did not feel like living in a flood- and disaster-prone area. So, after a couple of interviews, the question became more two-sided; first was elaborated in the interviews on if they feel like they live in a flood- and disaster-prone area, and then was elaborated on if they felt safe living in Mangkang.

\textit{Sub-question 3: To what extent are the inhabitants of Mangkang dependent on the goods and services that mangroves provide?}

This question is answered using the outcome of the semi-structured interviews in Mangkang and using the literature study. The goods and services that mangroves produce are elaborated on by the following authors: Hogarth (1999), Duke et al. (2007) and Dalem (2002).

\textit{Sub-question 4: To what extent do the inhabitants of Mangkang see mangroves as their cultural heritage?}

This question is answered using the outcome of the semi-structured interviews in Mangkang.

\textit{Sub-question 5: To what extent do the inhabitants of Mangkang care about the state of the environment they live in?}

This question is answered using the outcome of the literature study and the outcome of the semi-structured interviews in Mangkang. Hogarth (1999) elaborates on the state of the environment, regarding mangroves. Most experts spoken to in this research are activist who are passionate about saving the environment, especially mangroves. This is an important aspect to keep in mind in this research; most of the people interviewed are involved with mangroves and thus care about them.
Chapter 4: Research results & Analysis

In this chapter the results of the empirical research done in Mangkang are discussed. The results are divided into results from the 24 (street)interviews and the results from the observations in the coastal area of Mangkang. The observations were done to get a better understanding of Mangkang and the way people live and the way mangroves grow. The observations are used to support the data gathered from the (street)interviews. It must be held into account that all the quotes used in this research to support the data are from the interpreter, as it was impossible to quote the interviewee directly due to the language barrier.

4.1 Impact daily life

4.1.1 Characteristics of Mangkang

This first sub-question of this research is answered using the literature research and the outcome of the semi-structured interviews in Mangkang. It is important to also understand the field in which the interviews and observations were held. The goal of this section is to create a background on the way the inhabitants of Mangkang live. Section 4.1.2 elaborates on the historical background of Mangkang.

Semarang has 16 districts (kecamatan) and 177 sub-districts (kelurahan). Mangkang belongs in the Tugu district and is located in the North-West of Semarang, as can be seen in the figure below. It is a half hour drive from the city center. It is quite isolated from the rest of Semarang, which got clear from the fact that taxi drivers had a hard time finding the addresses, because the area was not mapped out in detail in Google Maps. Mangkang feels more like a fisherman village than as part of a city of more than 1 million inhabitants. Mangkang is quite an old sub-district, since many people interviewed have lived there for their whole life, which was sometimes up to more than 60 years. Also, in the interviews it was said by fishermen that they inherited their fishponds from their grandparents, who also lived in Mangkang. Many people grew up in Mangkang, they got married in Mangkang and they will grow old in Mangkang.

Figure 3: Semarang with its sub-districts (Sima, 2018)
Mangkang is divided by the people into two parts: The East (Mangkang Wetan) and the West part (Mangkang Kulon). The two biggest streets are called this way, the rest is built around it. The mosque – which can be seen in the figure below – is the city center. Goats – which can also be seen in the figure below – and chicken roam around freely.

![Figure 4 & 5: Mosque of Mangkang & goats roaming around freely (de Win, 2019)](image)

An overview of the characteristics of the inhabitants of Mangkang interviewed can be seen in the table below.

<table>
<thead>
<tr>
<th>No.</th>
<th>Gender</th>
<th>Name</th>
<th>Age</th>
<th>Job</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expert interviews</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Male</td>
<td>Masnun</td>
<td>Unknown</td>
<td>Fisherman</td>
</tr>
<tr>
<td>2.</td>
<td>Female</td>
<td>Machromah</td>
<td>Unknown</td>
<td>Housewife</td>
</tr>
<tr>
<td>3.</td>
<td>Male</td>
<td>Ferry Agnun</td>
<td>Unknown</td>
<td>Fisherman</td>
</tr>
<tr>
<td>4.</td>
<td>Male</td>
<td>Arifin Prenjak</td>
<td>Unknown</td>
<td>3 jobs:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Activist</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Office job</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- In the kitchen of a steakhouse</td>
</tr>
<tr>
<td>5.</td>
<td>Male</td>
<td>Eko</td>
<td>Unknown</td>
<td>Wetlands International</td>
</tr>
<tr>
<td>6.</td>
<td>Male</td>
<td>Suriri</td>
<td>Unknown</td>
<td>Activist</td>
</tr>
<tr>
<td>7.</td>
<td>Male</td>
<td>Abdul Roviq</td>
<td>Unknown</td>
<td>2 jobs:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Delivery &amp; packaging</td>
</tr>
<tr>
<td>Street interviews</td>
<td>8.</td>
<td>Female</td>
<td>Mufida</td>
<td>Unknown</td>
</tr>
<tr>
<td>9.</td>
<td>Male</td>
<td>Riyadloh</td>
<td>56 years old</td>
<td>Fisherman</td>
</tr>
<tr>
<td>10.</td>
<td>Female</td>
<td>Yuyung</td>
<td>32 years old</td>
<td>Midwife</td>
</tr>
<tr>
<td>11.</td>
<td>Male</td>
<td>Maimanum</td>
<td>54 years old</td>
<td>2 jobs:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Ministry of fishery and maritime</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Fisherman</td>
</tr>
<tr>
<td>12.</td>
<td>Female</td>
<td>Haryati</td>
<td>Unknown</td>
<td>Housewife &amp; artist of clothes</td>
</tr>
<tr>
<td>13.</td>
<td>Female</td>
<td>Wahidatun</td>
<td>Unknown</td>
<td>Housewife &amp; produces krupuk out of shrimp</td>
</tr>
<tr>
<td>No.</td>
<td>Gender</td>
<td>Name</td>
<td>Age</td>
<td>Occupation</td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
<td>------------------</td>
<td>---------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>14.</td>
<td>Female</td>
<td>Nurhayati</td>
<td>Unknown</td>
<td>Housewife &amp; helps other woman to become self employed</td>
</tr>
<tr>
<td>15.</td>
<td>Male</td>
<td>Zainal Arifin</td>
<td>63 years old</td>
<td>Laborer</td>
</tr>
<tr>
<td>16.</td>
<td>Male</td>
<td>Fernando</td>
<td>Unknown</td>
<td>Office job</td>
</tr>
<tr>
<td>17.</td>
<td>Female</td>
<td>Khoiriah</td>
<td>Unknown</td>
<td>Grandmother &amp; produces krupuk out of shrimp</td>
</tr>
<tr>
<td>18.</td>
<td>Female</td>
<td>Arumsari</td>
<td>Unknown</td>
<td>Housewife &amp; works in restaurant</td>
</tr>
<tr>
<td>19.</td>
<td>Male</td>
<td>Ita Melia</td>
<td>Unknown</td>
<td>Housewife</td>
</tr>
<tr>
<td>20.</td>
<td>Male</td>
<td>Supriyono</td>
<td>Unknown</td>
<td>Laborer in syrup factory</td>
</tr>
<tr>
<td>21.</td>
<td>Female</td>
<td>Jubaida</td>
<td>Unknown</td>
<td>Housewife</td>
</tr>
<tr>
<td>22.</td>
<td>Male</td>
<td>Muhammad Maphudi</td>
<td>Unknown</td>
<td>Office job</td>
</tr>
<tr>
<td>23.</td>
<td>Male</td>
<td>Kaji Dasuki</td>
<td>Unknown</td>
<td>Farmer on rice field</td>
</tr>
<tr>
<td>24.</td>
<td>Male</td>
<td>Basuki</td>
<td>46 years old</td>
<td>Policeman</td>
</tr>
</tbody>
</table>

4.1.2. 1998

Abidin et al. (2012), Aerts & Ward (2016) and Marfai & King (2008), among others, tell that mangroves help prevent coastal areas against sea level rise (SLR), floods and land subsidence. The outcome of the semi-structured interviews underpinned this. There was a clear distinction between the people interviewed that were involved with mangroves and the ones that were not. The people interviewed involved with mangroves – as activist, expert or when dependent on their goods and services – named all advantages above, while the ones not involved with mangroves most of the time knew nothing about them and never visited them, because they were too busy with their job as a laborer.

Mangkang has relatively big houses, they are middle- to upper class. This is because Mangkang was a flourishing area until the end of the 1990s. The inhabitants of Mangkang inherited their houses from their parents and their grandparents, so it is passed on to the next generation. Before 1998, the inhabitants of Mangkang could get their income out of their fishponds, they caught a lot of shrimp and other fishes. The Mangkang area was one of the places that contributed the most to the GDP (Gross Domestic Product). But now, they struggle harder to get an income. In the 1970s, under the Suharto regime, Mangkang was known for its fish. According to Mrs. Machromah (personal communication, April 6, 2019):

“They even made it even made it to earn kind of like an award coming from the president himself, because the production coming from this area was always very good. The fish were plentiful. But, after 1998, the big disaster that occurred here, everything was lost. Hundreds of fishponds were gone. And now, the next generation, probably the fourth generation is working as a laborer, working in a big factory.”

Before 1998, the inhabitants were not that interested to become a civil worker, because you could make more money by being a fisherman. But now, the condition is reversed. Nowadays more people work as a civil worker.
In Mangkang, there is a clear turning point visible in history. This was in the year 1998. After 1998, the Mangkang area started to get destroyed by land subsidence and tidal flood. Hundreds of mangroves were cut. Before 1998, there were hundreds of fishponds, but now there are only around 10-30 left. This was because people were uneducated about mangroves and did not know why they should not be cut down. The mangroves were cut down by the inhabitants of Mangkang, and also by investors. They were cut down for reasons such as wanting to use mangroves for firewood, or wanting more sunlight, or wanting to build houses. In the following years, it became clear why mangroves should not be cut down. Their houses were flooded, and many fishponds were heavily damaged by tidal waves. A period of extensive education began. This was being done by the government, but also by activists passionate about the environment, beginning with mangroves. A shift occurred in the thinking of the inhabitants of Mangkang. More and more people started to see the importance of mangroves. And slowly but steady more mangroves were being planted and were being taken care of. But it will take decades to restore the mangroves in their former condition. It takes 20 years up to 40 years of restoration. According to Mr. Agnun (personal communication, April 6, 2019):

“I think we can use the term human error over here. Because they were driven by the idea of getting more benefits.”

Mr. Eko (personal communication, April 9, 2019) is also speaking of a human error:

“It is a human error, you cut down mangrove without knowing the damage and the ones that should fix this problem is not you but your grandchildren, because they are the ones that are going to live longer than you and you probably are not going to witness the mangrove restoration to its former glory”

4.1.3. Benefits of mangroves

In the semi-structured interviews, it is explained by the expert activists that the first benefit people can get from mangroves is the fruit that a typical kind of mangrove bears. Mangrove fruit can be made into mangrove snacks, chips, krupuk, flour, syrup, jelly, candy, sweets, coffee, thee, medicine, desserts, natural coloring for clothes. The second benefit the inhabitants of Mangkang can get from mangroves is that they protect the environment they live in. Mangroves prevent erosion. The roots of mangroves can hold up the soil so that the surrounding area does not have quite the damage. According to Hogarth (1999), mangrove roots retain sediment and consolidate it. This way, they slow down coastal erosion. The roots of mangroves can be seen in the figure below.

Figure 6: Roots of mangroves (de Win, 2019)
According to Mr. Agnun (personal communication, April 6, 2019) land subsidence is also happening because:

“The reason why land subsidence is happening here is because the people overuse and exploit the groundwater. So, water that has been stored up for centuries just suddenly dies out, no more water underground. And no water means no surface to hold up the land. That is why land subsidence happens.”

According to a woman in one of the street interviews, her house was being buried under the ground. Her grandfather’s house was already completely buried underneath the ground and some of her neighbor’s houses, around one or two. According to her, the area is experiencing land subsidence of three until five millimeters in a year. According to a man in one of the street interviews, the land subsidence that is happening is not as bad as it was before. This is, according to him, because of the planting of mangroves. Before 2015, it was up to more than five centimeters in a year.

Mangroves also protect the environment the inhabitants of Mangkang live in by blocking tidal waves and thus tidal flooding. Mangroves kind of like absorb tidal waves and thereby reduce the intensity, speed and the power of a tidal wave. Fishermen plant mangroves around their fishponds to prevent them from getting flooded. Floods occur quite regularly, but the mangroves prevent the flooding from coming above ankle height. The floods that occur have three causes: the first one is tidal floods, the second one is flooding from water coming from the upper part of town and the third one is drainage overflowing and then flooding their houses, this is because of the rail that is covering the way the water flows. Mangkang is located in the lower part of the town. The flooding coming from the upper part of the town is occurring because the upper part of the town is made into housing complexed, while it used to be a green area with agriculture and plantations. The greener the area, the more it can absorb water. But they cut down all the trees and the plants to turn it into the housing complex.

Around five to seven years ago, a fatal accident occurred because of flooding. A man was trapped in his bus and was carried away by the flood. But overall, there are less disastrous tidal wave hazards than in the 1990s/2000s. There is quite a difference in how severely places are attacked by tidal waves in Semarang. For example, in the Tugu sub-district, located next to Mangkang, tidal floods rarely happen. But when another sub-district is attacked by tidal flood hazard, the flood will come up to knee height. In Mangkang, after 15 years of education and were people are now active in conserving mangroves, the tidal flood does no longer damage the infrastructure and their houses. The flood is decreasing, because of mangroves. In the interviews it became clear that there is quite the debate about how hard it is to grow mangroves. Some claim that mangroves are very hard to grow, others claim that they are easy to grow, and that people are just not doing it right. How mangroves grow can be seen in the figure below.

Figure 7: Baby mangroves (de Win, 2019)
In some mangrove areas, like Tugu sub-district, mangroves grow 2 meters high within 8 months. In other areas, like Mangunharjo sub-district, mangroves grow 30 centimeters in 1 up to 2 years. It is believed by the people in Tugu district that the way people grow mangroves in other districts is not done correctly. In most mangrove areas in Semarang, the people will plant mangroves, and then move on with their life. What they are doing in Tugu sub-district is that each active member of the community observes and studies the characteristics of the mangrove plants they grow. This way, they gain information on what works for a plant and how it grows fastest from nature itself. So: what kind of water does the mangrove plant need, what condition does the soil have to be before the mangrove plant is planted, under what condition does the mangrove up to 2 meters? What are the factors that make a mangrove plant grow and what are the factors that is holding growth back? And you learn this by doing, by thoroughly studying the plant. The mangrove grows by itself from what the nature provides, but you can help. The people must make sure the water is not polluted and that the soil is not containing any hazardous chemicals. According to Mr. Prenjak (personal communication, April 9, 2019):

“So, several disciplines that he adapted from the community is that; while planting mangroves it has to be connected to the people doing it. The second one: it has to be beneficial for the mangrove plant itself. So, the people who do the planting should consider the care and growth of mangrove trees to decide what is best to be done for the mangrove plant. It is like raising your own children.”

4.1.4. Pollution
So, mangroves can provide goods and services and can protect the environment people live in. The third benefit the inhabitants of Mangkang can get from mangroves is regarding the roots that mangroves have. The roots of mangroves have two benefits: first of all it helps to let the fishes stay inside the fishpond, because when the sea level rises, the fishes can get inside the fishpond, but then when the sea level goes down, the fishes are trapped in the fishpond, because the mangroves are there to block them. Second of all they help filter the water in the fishpond, because mangroves neutralize poison or hazardous chemicals through their roots and thus, they keep the water inside the fishpond healthy. So, the mangroves help by neutralizing the water, but they do not help enough. The pollution is too strong. Most fishermen do not harvest shrimp anymore, because shrimp is too fragile to survive the pollution. Fishermen often find dead fish and dead shrimp when the sea level goes down.

According to Hogarth (1999), mangroves face a lot of indirect and accidental threats. The extraction of river water upstream and the following change in the hydrological regime can alter sedimentation and salinity. Natural hazards, such as hurricanes and typhoons can cause severe damage. And then lastly, pollution, can also cause severe damage to mangroves. Pollution can happen in many forms: sewage, pesticides, toxic heavy metals or oil spills, for example. The pollution from heavy metals comes from mines or industrial waste. Sometimes the pollution is accidental, sometimes industries do not see the value mangroves have (Hogarth, 1999). The increase in wastewaters input – coming from industries, agriculture and households into the coastal area’s aquatic systems – is caused by the growth in population and rapid developments in the economy. This is a particular big concern in Indonesia, because it has one of the highest rates in diversity of marine organisms in the world. It is also the case that 140 million people live along the coast in Indonesia, of which a big part relies on their fishpond in order to get food and make a living (Dsikowitzky et al., 2011).
The pollution in Mangkang is happening by big companies and industries since the 1980s. According to Mr. Masnun (personal communication, April 6, 2019)

“Industries and companies just throw away their trash coming from all of those activities of their industry and company. But, one thing that is not very environmentally friendly is that waste that is coming from their places that is not processed yet. So, they are still hazardous and are containing chemicals and other substances that could kill the shrimp that is living inside the fishponds.”

The mangrove area is protected under the authorization of BLH, a governmental institution which name translates to the ecosystem and environment watch. But BHL is overwhelmed by the increasing number of industries and home companies. They cannot monitor every industry or home company one by one. And some industries or home companies profit of that and get away with not following the procedure of processing their waste in an eco-friendly way.

The waste problem that is being experienced in Mangkang is mostly industrial waste. The waste of these industries is liquid waste. The owners of the industries stated in the media that all of the waste coming out of their factories was already processed and eco-friendly waste. But the people living down the stream say otherwise. They say the water in their district has been polluted by liquid waste coming from those companies. The people do not know what to do, because the pollution is affecting the water, and thus the fishes they catch, their income. But it is also affecting their groundwater, and thus their agricultural land. They used to have agricultural land, where they planted and grew what they ate. But after the 1980s, their land started to get poisoned by the liquid waste coming from the industries. Their land is no longer fertile, so they can no longer grow food to eat because their food keeps dying. Their drainage system is also no longer working, all because of the hazards in the liquid waste from the industries. Because of this, the people had to sell their land. And they had to sell their land for a very cheap price to a developer, because a poisoned land is not worth much. But they had to sell their agricultural land to get a source of income, because they cannot sell the crops they grow on their land or the shrimp that they catch. Most people have given up on trying to find a solution for the liquid waste problem, coming from the industries. Almost 95% of the land in Mangkang belongs to developers now. According to Mr. Roviq (personal communication, April 15, 2019):

“What he expects is that a designated mangrove conservation area is owned by the people and that the land they live in and where the mangrove tree grows should never be sold to private companies and investors, because, well, if that happens everything will just become a catastrophe and that catastrophe is the result of their own capitalistic greed.”

So, the mangrove forest is affected by pollution, the land is affected by pollution and the water is affected by pollution. The industries must change the way they work for this situation to change, but the people can also change. Both industries and inhabitants should have an active contribution to the planting of mangroves. Industries are also exploiting the groundwater. The inhabitants of Mangkang use groundwater to support their domestic household, but the industries exploit it to get as much benefit as they can. So, it is very capitalistic. The industries are good for the economy, but bad for the environment. According to Mr. Eko (personal communication, April 9, 2019):

“It is really a big dilemma; if you stop the commercial industry, you have a healthier environment, but the economy is going bad. So, of course people would prefer more to the economy and developing their financial situation that is relying on the industrial sector. So, they could not just tell them to stop running and care for the environment. It is just a big dilemma. So, yeah, environment belongs to the lesser priority and economy still stays on top.”
The inhabitants of Mangkang feel like this government does not prioritize the environment. They feel like they are capitalistic to the point that they want to sacrifice a green living environment for something more profitable for them; a commercial industrial district. Mangkang was a sub-district, specially designed as an open green environment. Nowadays few mangroves have survived the hardship that has come their way.

4.1.5. Government

According to Hogarth (1999), properly done sustainable management by the government is ‘depressingly rare’. Too often, exploitation is completely unregulated, the management system is not adequate, or the enforcement is not strict enough. Habitat degradation is the result of this overexploitation, as well as a reduction in area and an overall loss of resource. With fewer mangroves at the coastal area, coastal erosion will increase and fewer fishes will be caught. But unwise exploitation is not the only threat that mangroves face. Often undervalued are the benefits of mangroves, or just simply not recognized. Mangrove areas are, too often, seen as waste land, only suitable for to be turned into something else more profitable. But when mangrove area is turned into a commercial district or agricultural land, the coastal erosion that will occur will reduce the value of the land. And without mangroves, the soil will get saline, which is not the best soil for agricultural land.

According to Mr. Masnun (personal communication, April 6, 2019):

“One of the ways in which the government is planning to deal with the flood issue is that they are going to resize the river.”

The plan is to widen up the river to 20 meters. But up until now no action is being taken. When it is raining hard for a longer period of time, around two hours, the riverbank will be flooded, and the villagers will get the tidal flood. It is best to have mangroves alongside the left and right side of the riverbank, because then they will protect the village from flooding and landslides. Each riverbank should have a natural barrier made of mangroves, for safety reasons. But the current situation is that more trees are being cut down than they are being planted. The government delivers words and actions, but no real actions. Usually, they create more problems when trying to solve a problem. This is because they get very easily distracted and because they are not always very professional at what they do. This is for example happening regarding the land subsidence problem; the government tries to take care of it but in the end, they end up causing more problems. They execute it halfway, and then they get distracted by the next project that needs to be done. And this how they create more problems. The government of Semarang, but also that of central Java has no commitment in trying to respond to environmental problems and problems relating mangroves. According to Mr. Suriri (personal communication, April 13, 2019):

“The hardship that he often gets is the lack of sponsor and the lack of understanding coming from government officials.”

They do have two ministries that care about mangroves; these are the Indonesian ministry for forestry and the Indonesian ministry for agriculture. Those two governmental offices work hand in hand with people in coastal eroded areas and have mangrove conservation and the growing of mangroves in coastal eroded areas on their agenda. The money for activists to keep going is coming usually from companies and not the government. What the big companies are doing is that when they get additional income, they will provide money, equipment and labor force to a community of people that care for the environment. When it comes to the government, what they
are doing is that they promise incentives, in the case of Mangkang this was regarding building a seawall to protect the area from tidal flood. The money that was promised was 650 million up to 1 billion rupiah (roughly 40,500 to 60,000 Euros), but only about three quarters was given. When the money stopped coming, the inhabitants could not continue building the seawall, so they stopped. Nowadays, the seawall is destroyed because by tidal waves, because the inhabitants of Mangkang did not get to finish it.

What is also happening often is that the government listens to the people complaining, they accept their proposal, and then they do not deal with it. The inhabitants of coastal areas try to contact another government, that of Jakarta for example, instead of Semarang, hoping that they will listen to them and reply to them. According to Mr. Prenjak (personal communication, April 9, 2019):

"Many people probably say that Semarang is a wonderful city, but he says it is not wonderful at all. All he sees here in Semarang is disaster upon disaster upon disaster. And the government officials have done nothing but to make it worse with their capitalistic ideals."

4.2 Social dimension

4.2.1. Safety feeling

This second sub-question of this research is answered using the outcome of the semi-structured interviews in Mangkang. Most of the people that are not involved with mangroves did feel safe living in Mangkang. The people that are involved with mangroves often feel like not enough is being done. They see the future as quite grim and are not sure if Mangkang will even be there. More mangroves should be planted, the government officials should care more, the inhabitants of Mangkang should care more, the industries should not be polluting their land. Some people have lost all hope on a bright future. They feel threatened by the disaster that might happen. One of the biggest treads is a tsunami happening. A man in one of the street interviews stated that in the past, the distance from Mangkang to the open sea was one kilometer. Nowadays, it is way closer to the sea, and he felt threatened by that. Another thread that can affect Mangkang is sea level rise, occurring because of global warming. But what nowadays is mostly causing flood in Mangkang is the downpour from the upper part of the town. This, combined with sea level rise, is causing the flood. Some people not involved with mangroves do feel they are not safe in Mangkang. This is mostly because they feel helpless, and do not know where to go and what to do when a big rain- or tidal flood is coming. And, there is a group of people who believe in God to protect their village.

Most people that are not involved with mangroves feel safe in Mangkang. They often feel safe, because the flood or disaster does not affect them directly. They feel safe because they have lived here for a couple of years and have not experienced a big disaster with their own eyes, so the area must be safe. According to Mrs. Kloiriah (personal communication, April 13, 2019):

"Tidal floods are nothing to be afraid of, because her house is located is quite far from the sea. That is what she thinks, she does not feel threatened by flood as well. Yes, she confessed that this place often gets tidal flooding, but that one is not very damaging and not very disastrous. So, she is fine living over here."

Some people also think that it is fine, because it could be worse. There is another sub-district in Semarang and when that district is affected by tidal waves the flood will be knee height. In Mangkang the flood will only be ankle height. They think that just widening out the river and digging out the river so it has more depth to contain the water will help. Also, the flood is coming from the rain downpour of the upper part of the city, and not from tidal floods, like before. There is a big
difference in the situation in the 1990s and the situation now, in the 2010s. According to Mrs. Haryati (personal communication, April 13, 2019);

“In the 1990s the disaster, of course, the disaster is way more destructive, after the massive cut down and also deforestation of mangrove forest they feel very threatened by the constant upcoming tidal wave, and also tidal flood. But now, after the planting of mangrove has been enacted as a program, where people constantly contribute, now she thinks she feels safe.”

And then there is also a group that just feels completely safe. They believe that Mangkang is rarely receiving heavy damages, that this sub-district is not affected by tidal waves or sea level rise, that the criminality rate is low, that the people live friendly and in peace, that their life here is comfortable, that everything is done proper, that the activity of mangrove conservation is very apparent, improving and developing. According to Mr. Basuki (personal communication, April 13, 2019):

“He does not feel threatened living her for 46 years. He was born here, he was raised, and he grew up over here, so he has been living here for almost 50 years. And so far, according to his observation, he does not feel like this area is disaster prone. He has ever seen tidal flood, it is only ankle height, so it is not very damaging, and he believes that this location will be fine.”

4.2.2. Seawall

One of the people being spoken to in this research was the designer – together with some other fishermen – for the proposal of the seawall. Other people of Mangkang took part in building the seawall. They got incentives for building the seawall from the BLH. The promised money was supposed to be between 650 million up to 1 billion rupiah (roughly 40.500 to 60.000 Euros). The money was not given all in once but was divided into small parts. But not all the money was given to the people, only about three quarters of it. And the government gave the incentives, but they did not go to the area and help the people out, they just gave the money and wished the people good luck building the seawall and tackling the pollution in the area.

So, the BLH said it was necessary to build a manmade seawall out of mangrove, and they have built it and it lives. But they could not finish it, because the money stopped coming and they did not have the money themselves to continue. But now, not complete, it was not strong enough to survive the tidal waves, land subsidence, global warming and sea level rise that was happening. What is left of the seawall can be seen in the figure below. According to professor Angoro, the dean of the environment and water biology faculty, the manmade seawall should have been made up to one cell. One cell means that the manmade seawall should cover Semarang, and should reach to the next city, in this case Demak. Because, if you only protect village B, village A and C will get destroyed if they do not have the right protection. But this costs money, and that is the problem. According to professor Angoro, this is the standardized and qualified way to make a seawall. But this will take a lot of years to build and complete, and now, the inhabitants of Mangkang have no protection from hard infrastructure. The BLH estimated that the manmade seawall will take up until 10 years to be built. But the inhabitants of Mangkang do not even know if the seawall will be built at all. They do not know if the seawall program is still continuing.
What the inhabitants of Mangkang think the government should do is provide a perfectly constructed strong seawall to protect them from tidal waves and floods. What the government is now planning on building is a sea-highway right above the mangroves. So, they are planning on blocking the tidal waves from the sea with this so-called sea-highway. Thus, the first protection for the inhabitants of Mangkang will be the sea-highway, and the second protection will be the mangroves. The mangroves will be located right behind and under the highway. The sea-highway will block the first and biggest waves coming from the sea, and the mangroves will hold back the remaining waves.

4.2.3. Hard infrastructure & Sea-Highway

Hard infrastructure
Making a comparison between mangroves and hard infrastructure in what protects the hinterland better is hard, because it really depends on the situation. If there is a really strong tidal wave and the waves are really big you cannot simply rely on mangroves trees as a natural barrier to hold back all the tidal waves and be a natural seawall to prevent the tidal waves from attacking the places where people live. So, first of all, it depends on the quantity of the waves. If the tidal waves are really big and strong, you go for hard infrastructure. If the waves are manageable you can look for other options, one of those options being mangroves.

Second of all, which kind of infrastructure is best relying on the type of soil and on the movement of the earth. Hard infrastructure works best in an area where the movement of the earth is very little. The situation must be very stable and not moving because of land subside or other geographical reasons. Another problem that can be encountered with hard infrastructure is that the material weighs too much on the soil, land subsidence can occur. And here, you also have the same difficulty in what to protect and where to stop. Here also applies that if you only protect village B with hard infrastructure, village A and C will be in danger. According to Mr. Eko (personal communication, April 9, 2019):

“He is saying that if we develop seawalls, that is 1 kilometer long, it will create a damage that is up to 9 kilometers forward or beyond.”

This is because if a tidal wave reaches Mangkang, coming from village B, Mangkang is in great danger. Because Mangkang only has the broken-down seawall to protect them, next to the mangroves. The reason why mangroves are also sometimes preferred is because mangroves are not as costly as hard infrastructure, and the maintenance is low. Also, not as much manpower is needed to sustain them. Hard infrastructure and mangroves are also good when combined. This is happening
with the building of the sea-highway, in combination with the mangroves. Hard infrastructure is designed for the outer part, and for the inner part you have mangroves.

**Sea-highway**
The government is said to be wanting to build a sea-highway. This will happen right above the mangroves. The sea-highway is expected to go through Semarang, and then all the way up to Demak city. So, the mangroves will stay alive, they will just be accompanied by hard infrastructure. But it is not clear if the program will continue. The presidential elections were just held, and it is up to the party who won the election to call the shots on the program. So, it is also not clear how much money will be allocated for the building of the sea-highway. The inhabitants of Mangkang would really like to see action, they are very eager to feel safe. Safe behind the protection of a seawall, instead of just mangroves. The community is urging the government to take real action, instead of just communicating the program.

According to Agustine (2018) of PWC Indonesia (PricewaterhouseCoopers International Limited, a separate and independent legal entity), the government was still choosing between loans from China and South Korea in December. The loan, used to finance a viability gap, would be between 3.5 - 15 trillion Rupiah, which is roughly 217 – 933 million Euros. The Sea Dyke spans 26.9 kilometers, in the figure – taken from an 8-minute long video – below it can be seen how the Sea Highway will look, crossing mangrove area and houses.

![Figure 9: The plans for the toll road Sea Highway from Semarang to Demak (Supurwo, 2018)](image)

The experts spoken to in this research were afraid that a lot of mangrove will be lost if the program continues. They are afraid that the government will put the priority on building the sea-highway and will not pay attention on preserving the mangroves. They are afraid that the government will just build the highway and connect the cities with this new transportation route. They are happy with this new transportation route, but they think that the government should keep protecting the mangroves in mind. Otherwise, a lot of mangroves will die unnecessarily. Also, the building of the sea-highway can be accompanied by a lot of complications. For example, the mangroves can be marinated by too much water. If they get too much water, the mangroves will be in shock and will die because of stress. So, just establishing a sea-highway is not that easy and will not take care of all the problems in the area. According to Mr. Roviq (personal communication, April 15, 2019):

“Because, if they really want to build a highway, then they have to sacrifice something, right? The mangrove forest will probably be buried under the construction materials.”
According to Mr. Masnun (personal communication, April 6, 2019):

“But they also have to care about this area. Because the highway is covering mangrove area. So, the government should at least provide more mangrove trees and plant more mangrove trees. If they start building the highway, he fears that they will cut down mangroves. So instead of cutting down mangroves, they should build more mangroves.”

If the mangroves are sustained and protected, they will also protect the sea-highway from getting destroyed by tidal waves. So, it is killing three birds with one stone. First of all, there is a connection between cities. Second of all, the area where mangroves are grown is being kept. And third of all, the highway is surrounded by a beautiful green environment.

4.3 Economical dimension

4.3.1. Goods and services that mangroves provide

The third sub-question of this research is answered using the outcome of the literature study and the semi-structured interviews in Mangkang. According to Hogarth (1999), the wood of mangroves is used as firewood, in the construction of buildings, and in manufacturing charcoal. People use the branches and roots of mangroves to secure their fishponds. Wood extraction is in some areas a local industry. Sometimes this is more or less sustainable in that it benefits the local community, sometimes it is far from sustainable. The fruit of mangroves is used as food and domestic animals can eat it as fodder. The bark is used for medicine, although the use of mangrove for medicine is discussed among scientists. According to Duke et al. (2007), if mangroves disappear, coastal communities protected by mangroves will then lose access to their source of food, timber, medicines and chemicals. An extended list of goods and services that mangroves provide can be seen below.

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Charcoal, firewood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Timber, scaffolds, railway sleepers, mining props, boat building, dock pilings, beams and poles, thatch, matting, fence posts, chipboard</td>
</tr>
<tr>
<td>Fishing</td>
<td>Fishing stakes, fishing boats, wood for smoking fish, tanning for nets/lines, fish poison, fish-attracting shelters</td>
</tr>
<tr>
<td>Textiles</td>
<td>Synthetic fibres (rayon), dyes, tannin for preserving leather</td>
</tr>
<tr>
<td>Food, drink</td>
<td>Sugar, alcohol, cooking oil, vinegar, tea substitute, fermented drinks, dessert topping, seasoning (bark), sweetmeats (propagules), vegetables (fruit, leaves)</td>
</tr>
<tr>
<td>Domestic</td>
<td>Glue, hairdressing oil, tool handles, musical instruments, rice mortar, toys, matchsticks, incense, cigarette wrappers, cosmetics</td>
</tr>
<tr>
<td>Agricultural</td>
<td>Fodder</td>
</tr>
<tr>
<td>Medical</td>
<td>Treatment of ringworm, mange, toothache, leprosy, sore throat, constipation, dysentery, diarrhoea, boils, bleeding lice, fungal infections, bleeding, fever, catarrh, kidney stone, gonorrhoea, etc.</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Paper manufacture</td>
</tr>
</tbody>
</table>

Figure 10: Goods and services that mangroves produce (Hogarth, 1999)

In the interviews it also became clear that mangroves are not only used for protection purposes, but also for financial benefit. Mangrove fruit can be made into mangrove snacks, chips, krupuk, flour, syrup, jelly, candy, sweets, coffee, thee, medicine, desserts, natural coloring for clothes. How this looks can be seen in the figures below. Firewood is also taken from mangroves. Different types of mangroves will result in different types of products. Natural coloring is being done with liquid waste coming from mangroves. So, it is very eco-friendly. There is a community of wives in Mangkang that produce clothes. Most of the wives of fishermen are producing clothes and see themselves as artists.
That is what the women are doing on a daily basis, they take the mangrove fruit that their husband take home and make them into sellable items.

And some of those businesses are quite a success, some make it to be exported to foreign countries. The biggest challenge for most people in Mangkang owning a small business, depending on mangroves, is marketing. They do not know how to reach more people and they do not have strategies for their marketing. What is also hard, is that they are very dependent on the right season to get mangrove fruit. Regarding mangrove fruit; you cannot simply harvest the fruit and produce snacks out of it. This, because mangrove fruit is poisonous. So, while mangrove roots are a poison neutralizer and neutralize liquid waste, mangrove fruit is poisonous. You must boil water and then let the mangrove fruit marinate in that for a whole day, 24 hours. Then, on the second day, you repeat this process. And then on the third day, the mangrove fruit is no longer poisonous. This process can be seen in the figures below.

In order to make mangrove fruit into sellable items, the community had to overcome some obstacles. There were struggles between the artists and the owners and planters of mangroves. The owners of mangroves – the ones that plant them, nurture them and take care of them – prohibit cutting down too much mangrove trees, because they do not want the mangrove area to be deforested. But the artists need (some part of) the mangrove tree to make their items. They need the mangrove fruit, but also the wood, bark and liquid coming from mangrove branches. These three parts of mangroves are necessary in making natural ingredients and coloring. So, producing sellable
items out of mangroves is contradicted with wanting to cherish the mangrove area. But a solution was found. The artists take the parts they need for their products from the old mangroves that are about to die and are no longer productive. They also take parts of mangroves that have died. Deep inside the mangrove forest is where these older mangroves live. They do not take the younger mangroves that are located on the edge of the mangrove forest. So, the artists are not killing any mangrove and they use them selectively.

People spoken to in this research claimed that mangroves should be protected, because they provide a source of income. That is common; some activists are really devoted to fixing the problem regarding mangroves, but most people do not care, or only care because they can get something out of it. That is also why most people are open to ecotourism. It could mean potential growth for their microbusinesses and they can get more chances to develop their business, because their handmade products will be more exposed to media. The activists like getting something out of their activism also. Some activists could continue their studies and got enrolled in college because of their mangrove conservation activities. Plus, activists often sell mangrove products and baby mangroves, mangrove seeds and mangrove fruit to people who wish to grow mangroves where they live. So, mangrove activism is providing people a source of income and an educational background. According to Mrs. Machromah (personal communication, April 6, 2019):

“The reason why it is very contrast between real life and expectation is because the people over here care more for building their life in good economic terms, so, they will just work and earn income only to care for their family, but not for the environment. (...) So, you can say, the people here they just care for their own occupations.”

The reason why people stay is also grounded in economic reasons. For the fishermen it is hard to continue working as a fisherman if they live somewhere else. The wives of the fishermen are also actively involved with mangroves and are thus tied to the coastal area. So, if they move, their source of income would be gone. They are dependent on the mangrove. And for the people who are not actively involved with mangroves it is too expensive to move away. Most people in the area have financial issues and struggle to make a living. They are also very attached to the place. They grew up here and will grow old here. Also, it is the husband that decides. The husband must initiate the idea of moving away and the wife will just stay in the area until then.

4.3.3. Ecotourism

According to Dalem (2002), ecotourism is ecological, economic, of importance to coastal communities and should be a responsible travel to the respective area with the conservation of the environment in mind, while improving the welfare of those coastal communities. Ecotourism is – first of all – ecological, because it should protect and conserve the area. It is – second of all – economic, because ecotourism can be a tool for a sustainable economy, in which people profit from mangroves, but where mangroves are also protected. This is, lastly, also meant with the importance for coastal communities. Ecotourism should empower the coastal community, meaning that the inhabitants of coastal communities can play a role in ecotourism. If local coastal communities are involved in ecotourism, and if they can get an economic benefit out of it, they will feel responsible for the conservation of mangroves in order to sustain this new source of income, together with an active participation.

There are five principles that should be followed in the ecotourism business: first of all, nature conservation programs should be supported. Second of all, local communities should be involved. Third of all, the local coastal community should benefit from the ecotourism site. Fourth of all, the
socio-cultural and religious values of the local coastal community should be respected. And finally, obey to the rules of environmental conservation and tourism. The philosophy of sustainable development in coastal areas can be promoted through ecotourism. This way, ecotourism can be for more than conservation. Careful management and planning of the ecotourism business is crucial in contributing to a sustainable development of the area. The area should thus be ecologically sensitive, economically viable and culturally appropriate (Dalem, 2002).

All the experts spoken to thought it would be a good idea to develop ecotourism. The MangroveEduPark is now the only ecotourism site in the area. Mangkang was also supposed to be developed into an ecotourism site, but they still face a lot of hurdles and difficulties in turning this place into an ecotourism site. The fishermen would not mind ecotourism, the land already is not theirs, and if the area would be turned into an ecotourism site, they could probably still go to their fishpond. Plus, they could probably earn additional income. This is because they could function as a tour guide, bringing the visitors into their boat and peddling them around. But they have one condition; they should keep the environment the way that it is or even improve it. But most certainly not destroy it.

So, there is a clear ‘yes, but’ mentality among the people being interviewed. They have terms and conditions. The first term and condition is that the amount of visitors being allowed in the park should be restricted. The developers should put a quota on the amount of visitors that are allowed in the ecotourism site per day. This must be carefully restricted and monitored by the developer. In the interviews also came forward that too much of a capitalistic attitude will not do the area good. The coastal area of Mangkang should not be turned into a completely touristic place. Because that will destroy the environment. They want to have an MangroveEduPark, like the one that already exists. So, you combine ecotourism and edupark. What they want, is already in the name; eco and edu. The ecotourism site should educate the visitors about the mangroves instead of just showcasing them, that is the second term and condition.

The third term and condition is that the ecotourism site should be advertised in a certain way. Because, if the purpose of the ecotourism site is to educate people, it should not be advertised as just a fun touristic attraction too much. The experts interviewed in this research agreed on that the target group of the ecotourism site should be young children, so kindergarten children. You can teach them which mangrove is naturally grown and which part is cultivated by men, different types of mangroves, the ecosystem surrounding the mangrove area, how to plant mangroves with their own hands, how it gives a benefit to the people. The reality is that instead of kindergarten children, the visitors of ecotourism sites are mostly teenagers and adults. These people usually take some selfies, or even pre-wedding pictures, and then leave. They could also be educated about the situation. Also, the ecotourism site could be an object of research for students.

Interviewees being spoken to had interest in becoming one of the people who really participate in the ecotourism program for mangroves. What is being regretted about the possible ecotourism site is that the government does not have an active response towards the idea of establishing mangrove ecotourism. They only deliver words and promises without any real actions. The experts interviewed in this research told that the active mangrove community of Mangkang will be very dedicated towards developing the ecotourism site and taking care of the mangroves. According to Mr. Suriri (personal communication, April 13, 2019):

“That is what he thinks, and he adds that the idealism that he believes in is to contribute to nature and to take care about nature for as long as he lives. So, when he is still alive, although he is now an old man, he will still do his job.”
The problem might be that other people – outsiders of that community – are not so exposed to education about mangroves. And the government might belong to that group. They do not know why mangroves are important and why mangrove could prevent disaster. The developing of the ecotourism site could be slow because of it. So, turning the mangrove area of Mangkang in an ecotourism site could be a good idea to bring the conservation of mangroves together with the hunger for profit. And if you add the element of education, the visitors will not only go there, but they will actually learn something there too. They can learn there first-hand and with their own eyes how important mangroves are.

Semarang is already quite known for the existence of mangroves at the coastal area. For example, by people living in Japan, South-Korea, Netherlands, France, Switzerland, USA and Canada. This is a great opportunity for city marketing. Having more ecotourism sites means more media exposure and thus more fame. Foreign people already know that this is the place to plant mangroves, so that position could be expanded to something bigger. This way the reputation Semarang already has can be turned into a real product. And that real product is ecotourism.

4.4 Cultural dimension
4.4.1. Cultural heritage & Conservation
This question is answered using the outcome of the semi-structured interviews in Mangkang. The people involved with mangroves see them as their cultural heritage. They also see mangroves as something other people should really care more about. People should take part in the active improvement in conservation of mangrove trees and they should not neglect the essence of mangrove forest. They think that the people in Mangkang do not take good care of the mangroves, while they get something from it, so they should do something in return. For example, a lot of goat owners let their goats roam freely, while this is – aside from crabs that eat the roots of mangroves – the biggest threat for mangroves because goats eat mangrove leaves and bark. And that while the mangrove is the only tree that exists around there to feed them, protect them and help them to live and to continue their wellbeing in terms of that they can make something out of mangroves and make an income.

Within the people that were not involved with mangroves a distinction was also noticeable; the people that knew something about mangroves usually did not see them as their cultural heritage and they did not see them as their responsibility because they were too busy with their work as a labourer, but they did think they were important. They just did not have any spare time. But the people that did not know anything about mangroves, automatically did not think they were important. Because, if they were important, they would have known about it. According to Mrs. Ita Melia (personal communication, April 13, 2019):

“Since she does not know really much about the mangrove, the ecosystem and also about conservation, she does not think that it is important, because she does not simply know what is so special about them. She has never been to an activity like trying to plant mangrove, caring for mangroves. She has never been to such an activity, so she does not know what to do and she does not feel like she needs to care about that.”

There are also people who support the activity of mangrove conservation, but for themselves personally they do not get involved so much with the activity of mangrove conservation. They believe that there are already communities and organizations of people that deal with it. Most people just care about their own job and they leave the mangroves to those who care about it. Most inhabitants
of Mangkang are not involved in mangrove conservation activities. Even if they care, most people do not plant mangroves themselves. The people who plant mangroves in Mangkang are students, mostly university students and high school students.

If the mangroves disappear, and Mangkang floods and becomes inhabitable, the people have no place to live anymore. The people should be educated on that. The people should also be educated on other aspects, such as throwing trash away and littering the water. This is one of the reasons flood is also happening; due to the trash problem, rivers and drainage systems are covered up by trash, causing there be not as good of a flow. But most people see littering not as something that is related to environmental issues. In the past century, before 1998, people did not care about mangroves at all. They saw mangroves as just any other tree, just as something that can be used for the foundation of their house, for their doormake, firewood etc. But now, after several years of education and exposure via workshops and activities about the importance of mangroves for people and the impact on people’s life, the inhabitants of Mangkang are starting to get it and they start to get active in the conservation process. So, the education is happening, but it could be more.

The relationship between man and woman in Mangkang is traditional. The men are the ones who go to the field, fishpond, open sea or mangrove forest and takes care of those things. The men are the ones who plant the mangroves and go fishing. The women stay indoors and do domestic tasks, like cleaning the house and taking care of the children. And when the men go home, they carry their harvest with them, this could be mangrove fruit, shrimp or fish. The women then start processing what the husband provides. They are the most eager to get mangrove fruit, because they can make the most out of that. But if it is not the season for that, they will make krupuk and other products out of the other ingredients the husband provides. This means that women are not directly involved in the conservation of mangroves. Before 1998, the men had a lot of harvest to take home. Nowadays, that is a lot less. The disaster of 1998 changed this. Now, also not everyone is a fisherman, a lot of men work as a laborer.

Some interviewees did not like the term cultural heritage. They saw cultural heritage as something that is passed on from generation to generation and they did not think of mangroves as this. They saw it as something that is there and that should be preserved, rather than a heritage. It is a manmade cultivation, an endangered species that should be protected for the future generation and for the years to come. According to Mr. Prenjak (personal communication, April 9, 2019):

“Some kind keep sake that was trusted to us by previous generations to continue caring for and growing the mangrove for the sake of future generations. For our children and grandchildren.”

4.5 Environmental dimension

4.5.1. State of the environment

This question is answered using the outcome of the literature study and the outcome of the semi-structured interviews in Mangkang. According to Hogarth (1999), while the history of shrimp farming is often disastrous, this does not mean it cannot be sustainable in the future. Sustainable shrimp farming is possible, and it is clear that constructing fishponds while destroying mangroves is not sensible. Sustainable aquaculture, without the cutting down of mangroves, could solve the shrimp-farming problem. Planting mangroves is happening in many countries, sometimes to restore the mangroves that were lost, and sometimes to create an ecosystem. This is all done because the value of mangroves is seen nowadays by more and more people.
The only places in Semarang that have mangroves are the Mangunharjo and Mangkang sub-district. As told before, Mangkang used to be a flourishing area where the people did not care about mangroves. After 1998, this changed. In the early 2000s, mangroves were planted by the inhabitants of Mangkang themselves. This happened until 2007, but then the incentives that were coming from BLH stopped. According to Mrs. Machromah (personal communication, April 6, 2019):

“And the ones that care for it are foundations and NGOs. Not the people living here. They only care and only take real actions when they have the incentive, ones the incentive stays out than their integrity also falls out.”

So, the ones that support mangrove conservation are foundations, NGOs and two governmental offices; the Indonesian ministry for forestry and the Indonesian ministry for agriculture. What has been implemented in Indonesia is a specific policy and set of rules to prevent people from destroying mangroves. Also, the government has forbidden the illegal logging of mangroves.

Most of the inhabitants of Mangkang are not involved with mangroves and do not take care of them. This is because their occupation has nothing to do with mangroves, and they just care about their job and making enough money to live. The ones that care are a few passionate activists and fishermen. Aside of that, only outsiders care. It are the university and high school students with their sponsors who plant the most mangroves. More mangroves should be planted, but it will not be possible to obligate the inhabitants of Mangkang that. This, because of financial issues. The inhabitants of Mangkang are struggling enough with their own household economy. So, if the money to plant the mangrove trees should come from the inhabitants of Mangkang, that will not have significant changes, because they have no money to spare. But also, the university and high school students plant the mangroves via a business run by someone. So, yet again the real purpose is not really to care for the environment, but to earn money.

One of the interviewees was in a youth community with other people who had concern in the environment, climate change and mangroves. A youth community is a group of people who have a common interest and they discuss those topics. He proposed a way of working that was really focused on managing the environment to be safe. Where the mangroves would not have to be the victim of hazard. But his proposal was seen as not profitable and his friends walked out on him. Because they focused on income and financial benefit, even while they were in a youth community for the environment. The man interviewed in this research took over the youth community and ordered his remaining friends in the youth community to start planting with strategy. Another interviewee saw how the environmental situation got worse from year to year. He saw that the mangrove forest was not as vast as it was before, how the mangroves were struggling to survive and how the water was polluted. About 1.8 million hectares of mangroves is damaged nationwide. He and some friends filed complaints by the government but did not really get an active response. So, in 2003, they decided to do it by themselves and they became activists.

The attitude of people can be quite hard to change. It has been difficult to get the younger generation to care more about the environment and to get them to join communities and to participate in mangrove conservation activities. Even people who do not join these kinds of things can still contribute by not littering, for example, or limiting their waste. Changing the attitude of people has been hard, because this way of living has been normal for generations. According to Mr. Roviq (personal communication, April 15, 2019):
“And it is hard to simply tell people hey come on lets join our community, we are trying to protect the environment and save your lives by planting more mangroves, please spare some of your free time to come with us and go to the river and the coastal area where mangrove forest lives and we will take care of it, do not just sit around in the inside of your house and develop more awareness on the environment you live in.”

In the past, people were quite reluctant to volunteer in planting and growing mangroves, because they were not so familiar with the existence of mangroves, and most of all, why mangroves were something special. When outsiders from universities came and started planting mangroves, the inhabitants of Mangkang thought that what they were doing was useless. But through several years of exposure to education about mangroves, a shift has occurred in the attitude of people. The people who were against the protection and conservation of mangroves in the past, are now volunteering to plant them.

4.5.2. Future
Predictions on the future are always difficult, because nobody can really tell, and it all depends on a lot of different factors. The predictions on what will happen in the next 5 to 10 years were very varied. Some interviewees are very optimistic, they think that – because of the mangroves that are planted – Mangkang will no longer suffer from tidal floods in the future. The only flooding that will happen will be happening because of rain flooding. The land subsidence problem will also be effectively tackled, according to these people.

Others say that it depends on what the inhabitants of Mangkang will do to prevent any disaster from happening; will they care for mangroves or not? And even if more mangroves are planted, growing mangrove trees does not happen overnight. A seawall must be built out of bamboo trees or concrete constructions. Another factor on which it all depends is the government. Some interviewees spoke about a government program in which the coastal area would be wiped out because of city planning. But if the mangrove trees are gone, the coastal area will be flooded. The factories in the industrial district, located in the coastal area are built on a steady concrete and hard construction and they are also built higher than the villages in the coastal area. If the coastal area is attacked by tidal floods, than the industrial district will survive it, but the villages will not.

According to Mr. Roviq (personal communication, April 15, 2019):

“If the commercial industrial district increases in number, than that is also equal to the number of disaster that will be received by people living in coastal area.”

An expert interviewed in this research said that Demak will be flooded in the future. By 2030, it has probably disappeared underneath tidal waves. This is if the people do nothing to prevent this from happening. Semarang can end up like Demak as well, if economic growth is chosen over environmental growth in the future. According to Mr. Prenjak (personal communication, April 9, 2019):

"Just change the people, change the mindset, change the policy. Otherwise, this environment will become a disaster, if we do not start changing everything.”

According to Hogarth (1999), the pressure of human activity on mangroves is relentless. The amount of mangroves that are untouched by human activity is very few. Destruction of mangroves, pollution, over-exploitation, climate change: mangroves are facing a lot of hardship. If nothing is done, the areas where mangroves grow will reduce even more, and will not be big enough to support the different species that rely on mangroves. The question rises if there even is a long-term future for
mangroves. The future of mangroves lies in regulating its interaction with humans, instead of isolating them from human activity. Or in short; effective management. Education is the first logical step in order to make this happen. Planners, politicians and coastal communities must value mangroves, in order to protect them. Short term advantage should be traded for long-term advantage. For example: cutting mangroves for their wood has a short-term financial benefit, but in the long-term coastal erosion will happen and will decrease the value of the land. So, one should evaluate all the costs and look to distant horizons. Danger in that is, though, that the people who gain often have more power than the people who lose. The government has a financial benefit in turning the coastal area to housing complexes, while the coastal communities lose their subsistence.

Some of the pressure’s mangroves face – like sea level rise – cannot be changed by the local coastal communities. Mitigation rather than prevention is realistic here. If, when planting mangroves, the vulnerable stages can be nurtured correctly, mangroves might survive in a climate that is no longer ideal. If the value of mangroves is seen, and sufficient, intelligent and informed coastal management is sustained – now and in the future – people can get the benefits of mangroves without destroying the habitat.
Chapter 5: Conclusion

5.1 Conclusion

This research is focused on the societal impact of mangroves on the way inhabitants live in the coastal area Mangkang in Semarang, Indonesia. The main question of this research is: “What is the societal impact of mangroves on the way the inhabitants of the coastal area Mangkang live in Semarang, Indonesia?”. Societal impact is about the assessment of social, cultural, environmental and economic effects from research results or outcome of publicly funded research.

The social dimension is specified to the feelings of safety of the inhabitants of Mangkang. The focus is on subjective safety and thus on how individuals perceive and experience their safety. The economic dimension is specified to the goods and services that people can get from mangroves. These are for fuel, construction, fishing, textiles, foods and drinks, domestic, agricultural, medical and miscellaneous. The cultural dimension is specified to cultural heritage and if the inhabitants of Mangkang see mangroves as their cultural heritage and if they feel responsible for the conservation of mangroves. The environmental dimension is specified to the awareness of people about the environment they live in and how they feel about the future.

In Mangkang, there is a clear turning point visible in history. This was in the year 1998. After 1998, the Mangkang area started to get destroyed by land subsidence and tidal flood. Hundreds of mangroves were cut. Before 1998, there were hundreds of fishponds, but now there are only around 10-30 left. This was because people were uneducated about mangroves and did not know why they should not be cut down.

The increase in wastewaters input – coming from industries, agriculture and households into the coastal area’s aquatic systems – is caused by the growth in population and rapid developments in the economy. Too often, exploitation is completely unregulated, the management system is not adequate, or enforcement is not strict enough. Often undervalued are the benefits of mangroves, or just simply not recognized. Education strategies, socioeconomic risk policies and effective governance structures are necessary to make sure no more mangroves are lost and to make sure that future generations can enjoy them also.

Mangroves are a cultural heritage that belongs to all people. We all have the responsibility to appreciate, conserve and understand what was given to us by previous generations. Cultural heritage is the accumulation of historic developments which are now integrated in modern life. It is dynamic, ever changing and open for growth. All cultural heritage is unique, irreplaceable and functions as the foundation for future development, today and in the future. With increasing globalization nowadays, the conservation, protection, presentation and interpretation of cultural heritage is more important than ever and is an important challenge for all.

The philosophy of sustainable development in coastal areas can be promoted through ecotourism. Tourism is one of the drivers for cultural exchange. It provides a personal experience, not only with what has survived from the past, but it also gives a glance into the life of others. Ecotourism is on the rise, because the economic characteristics of the heritage are captured, thus providing funding for conserving the heritage while also educating the visitors. This way, ecotourism can be for more than conservation. Careful management and planning of the ecotourism business is crucial in contributing to a sustainable development of the area. The area should thus be ecologically sensitive, economically viable and culturally appropriate. When implementing ecotourism in a mangrove area, it should bring benefit to the coastal community and it should motivate them to care for and maintain mangroves. This way, people profit from mangroves, but mangroves are also protected.
Destruction of mangroves, pollution, over-exploitation, climate change: mangroves are facing a lot of hardship. If nothing is done, the areas where mangroves grow will reduce even more, and will not be big enough to support the different species that rely on mangroves. The question rises if there even is a long-term future for mangroves. This future lies in regulating its interaction with humans, instead of isolating them from human activity. Or in short; effective management. Education is the first logical step in order to make this happen. Planners, politicians and coastal communities must value mangroves, in order to protect them. Short term advantage should be traded for long-term advantage.

The societal impact on the way the inhabitants of Mangkang live is big. It has an impact on every dimension of the community of Mangkang. This was noticeable on how they lived with floods, how they only cared when they were dependent on the goods that mangroves provide, on when they saw them as cultural heritage and how they thought about the future. In conclusion it can be said that there was a clear distinction between the people interviewed that were involved with mangroves and the ones that were not. The people interviewed involved with mangroves – as activist, expert or when dependent on their goods and services – cared a lot about mangroves, while the ones not involved with mangroves most of the time knew nothing about them and never visited them, because they were too busy with their job as a laborer. Here lies the problem of mangrove conservation: most people do not have the luxury to focus on long-term problems, because they have to focus on making enough money to provide food for tomorrow. This has to change first, in order for people to be able to really care for mangroves.

5.2 Reflection & Recommendations
Writing this thesis and doing fieldwork in Semarang taught me a lot. I really loved getting an insight in such a different culture than the one we have here in the Netherlands. And to see the mangroves in person was mesmerizing.

Unexpected situations occurred while doing this research, but that is not a bad thing. For example, during the preparations for Indonesia – so before we even left – there happened to be a mistake in all of the letters I got from our contact person in Indonesia, so everything had to be sent again in order for me to be able to apply for the visa. This taught me to always double-check everything. When we were in Semarang, a lot of unexpected things happened too. For example, we did not know that you had to get a letter from the university for all the places you would like to visit, and that you had to give that to the leader of the district. If we would have known about this quite bureaucratic process, we could have started the application for the letters earlier. I also never realized beforehand that most people pray every day, and so that they are unavailable between 13-14 o’clock. I also did not know that the elections would be an obstacle in this research. The day I wanted to conduct the street interviews one of experts I interviewed offered to help me and show me around to people. He also told me that most people were gone that day because they were celebrating the election. He told me that I should come back another time, but this was not possible because I was running out of time for my research. When I started walking around, trying to find interviewees, I found more than enough, but it did teach me to calculate in the obstacles that may be ahead. What was hard too, was that my interpreter had a very busy schedule, so that we could do full day length research on the weekends only. Full days were necessary, because the Mangkang sub-district was, without a traffic jam (which was rare), a half hour drive away from our apartment. This made it not worth the journey if we could only go there for a short period of time. The busy schedule made the very limited time we had to do research in Semarang even more limited, but I managed to conduct enough interviews to
get a good idea of Mangkang. What was difficult though, was that, once we were back in the Netherlands, we could not add any more empirical data to our research.

What was surprising to me during this research was how incredibly helpful all the people I came across were. Everyone we approached was willing to participate in the research and they all invited us into the shadow of their homes. They all offered us food and/or drinks too, some people even offered us a whole meal if we were there during breakfast or lunch. Beforehand, I thought the language barrier would be a bigger problem. But my interpreter turned out to be wonderful, the interviewee could talk for 5 minutes and still she could translate everything to me. Of course, some things might be wrongly interpreted, but overall I really think the miscommunication in this research was very low. What I also really liked about this research was that it had a set timeframe. Of course, this also has downsides, like said before, but the wonderful thing about it was that our research had to take place in that timespan. And when we were back in the Netherlands, processing our data could begin. It was not until than that we noticed how far ahead we were on the rest of the people writing their thesis. Most of them had yet to begin with interviewing people.

To build further on this research three recommendations can be made. The first one is that further research can be done on the social side of a technocratic story. When doing research on this topic online, I found tons of literature on what mangroves are and how they can protect coastal areas, but little about what impact they had on the people they were protecting. Second of all, this research only focusses on Mangkang and its inhabitants and this could be taken broader and more neighborhoods in Semarang could be researched. This could happen in Mangunharjo, the only other sub-district in Semarang that has mangroves. The third recommendation is that a follow up research could be done in Mangkang to see what the then current situation is. The disaster that happened in Mangkang happened not that long a time ago. Since then, the people had to get aware of the problem and then had to adapt their ways of doing. I might be interesting to see what the situation is in 10 years.
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Appendices

Appendix I: Expert interview guide
1. Can you tell something about yourself and what do you do for a living?
2. What impact do mangroves have on your day-to-day life?
3. To what extent are you dependent on the goods and services that mangroves provide?
4. What role does flood play in your life?
5. Do you feel safe in this flood prone area?
6. Mangroves belong to one of the most endangered ecosystems of the world. Do you see mangroves as your cultural heritage?
7. Do you feel responsible for the conservation of mangroves?
8. What do you think of mangrove ecotourism?
9. Do you think mangroves are better for coastal protection than hard infrastructure (dams, dykes, seawalls etc)?
10. How do you see the future in 5-10 years?

Appendix II: Street interview guide
1. Can you tell something about yourself and what do you do for a living?
2. What impact do mangroves have on your day-to-day life?
3. To what extent are you dependent on the goods and services that mangroves provide? (economic dimension)
4. Do you feel safe in this flood prone area? (social dimension; safety feeling)
5. Do you see mangroves as your cultural heritage? (cultural dimension)
6. Do you feel responsible for the conservation of mangroves? (environmental dimension)
Appendix III: List of codes

- 1998 (19)
- cultivation (12)
- cultural heritage and conservation (27)
- ecotourism (20)
- education (12)
- enemy of mangrove (6)
- fishpond (11)
- flooding (36)
- future (16)
- goods and services (32)
- government (34)
- hard infrastructure (8)
- highway (10)
- impact daily life (35)
- incentives (9)
- land subsidence (11)
- moving away (5)
- ownership (5)
- pollution (21)
- quote (13)
- safety feeling (17)
- seawall (18)
- state of the environment (41)
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