Behavior of people and policy in a subsiding and flooding area, Semarang Indonesia

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Foreword

This is the thesis that I wrote to finish my Bachelor in Human Geography at the Radboud University Nijmegen. For this research I investigated the behavior of people and the policy of the government in Semarang, a city in Indonesia. For a longer time the media and the politics talk about climate change but these effects on the population and the influence of this on policy is not often mentioned. I wanted to know more about these topics. Eventually I focused myself on land subsidence and flood in the coastal area of Semarang which influences the behavior of people and the policy of the government.

   I would like to use this foreword also to thank several people. At first my supervisor, Martin van der Velde, thank you for your helpful remarks and feedback. Furthermore I would like to thank my interview respondents for their time to let me interview them. I would also like to thank my parents, and especially my mother, for their support and their patience, without them it would be hard to write. Furthermore, thank you Samar for (re)reading my thesis while I was writing it.

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Summary

Semarang, Indonesia, is coping with land subsidence and flood. There is a high land subsidence rate in the coastal areas, this subsidence combined with seawater tidal flooding causes a high flood risk. Moreover, due to the sea level rise there is an even higher flood risk. People in the coastal areas have to cope with this land subsidence or they have to move away from this area. Beside the behavior of people, the government has to develop a flood policy that focuses on protecting the inhabitants of the coastal area from tidal floods. This research focus on the coping strategies of people in the coastal area and the reaction of the government on the land subsidence and the flood, whereby there might be a discrepancy is between the behavior and the policy.

For this research, data is gathered through a literature study and conducting interviews. These interviews are analyzed with qualitative content analysis. Whereby the most important aspects of the data can be related to each other.

The behavior of people in the coastal area is analyzed by the theory of planned behavior. The theory of planned behavior focuses on the intention of people to perform behavior; this intention is influenced through three predictive factors: the attitude, the subjective norm and the perceived behavioral control. These three factors are used for analyzing people's reaction on the land subsidence, the flood and the rising sea level. If the government is aware of the behavior of people living in flood risk areas and takes this behavior into account when formulating the policy, a more holistic and integrated policy can be designed.

Beside analyzing the behavior of people, the policy of the government should be analyzed. The flood policy can be analyzed with the policy process. The policy process has different stages that can be followed when formulating the government policy. This policy process is used to analyze the current flood policy. This current policy mostly focuses on technical measures; environmental and socio-economic developments are not taken into account. For a more holistic flood policy these developments should be taken into account when formulating the policy.

These two theories are related to each other; different factors of the different theories can be linked to each other. This interrelation in important because this way it is possible to formulate a flood policy that focuses on the behavior of people but also on the important aspects of a flood policy. If these aspects are combined, a more holistic flood policy can be designed.

The majority of the people living in the coastal area of Semarang stay here despite the flood threat; this is mostly because they do not have enough capital to move away. Therefore, they make adaptations to their house and their living environment, like raising the garden level and elevating the house. Beside adaptations made to the house, most people also contribute to the neighborhood protection, by for example elevating the street level and improving the drainage system. This way people are also indirectly protected from the flood. Moreover, the social contacts in the neighborhood are important for people, it can be used to help with the aftermath of the flood but it can also be a reason to stay in the area.

The government has taken several measures to cope with the flood. These measures focus on the infrastructure and the social environment by enhancing people's knowledge about the flood and flood protection. Though, these measures are taken by the government on knowledge that is based on incomplete data. There is insufficient data about flood, sea level rise, groundwater withdrawal and hazards. By enhancing this data with more up-to-date statistics and by developing future scenarios about these topics, a more complete and integrated policy can be developed by the government. For this policy, it is important that the different ministries work together.

Furthermore, corruption is a big problem in Semarang. Only a small amount of money is eventually used for the intended project of measure. The population of Semarang is aware of this corruption, whereby they do not trust the government with their money. For several projects this suspicion can make it hard to implement policy, for example with the Banger Polder Pilot Project. Citizens did not want to pay taxes to the government because they did not believe that their money would be used for maintenance. Furthermore, the corruption makes it hard to implement policies since a large percentage of the money intended for a project disappears before it can be used.

Content

1. Introduction

1.1 Framework

Indonesia is, after China and India, the most vulnerable country in Asia when it comes to flood hazard (Dewi, 2007). Therefore, it is important that Indonesia has a good flood policy. Beside this vulnerability for hazard is Indonesia also coping with floods, land subsidence and climate change. Climate change is affecting people living in urban areas (Satterthwaite, Huq, Reid, Pelling, & Romero Lankao, 2007). It is expected that the intensity and/or the frequency of extreme weather will increase; this trend is already seen in the last decades whereby more natural disasters took place. It is expected that the flood risk will rise in the future due to the climate change. Moreover, the flood hazard should also be taken into account.

Flood hazard is, of all the natural disasters in the world, the most frequent phenomenon. In a ten year period (1993-2002), most of the hazard is caused by flood; the remaining natural disasters are caused by windstorms, droughts, landslides, forest fires and heat waves (Sivakumar, 2005). Flood hazard can be influenced by several processes, such as the high tides in relation to astronomical tidal activity, wind, high sea level combined with high river flows and the sea level rise due to global warming (Marfai & King, 2008a). Beside the land subsidence and the tidal flood, these processes will have an effect on the coastal area of Semarang, Indonesia.

Land subsidence is a big problem in Semarang. The land is slowly sinking which influences the population and the land use. It also causes numerous problems in Semarang such as damage to the infrastructure and public and private buildings, changes in the elevation, extra costs of pumping water to the flood canals and tides moving into low-lying areas that were previously at high-tide level (Marfai & King, 2007). Since 1983 the local government has been measuring the land subsidence. These measurements show that the land subsidence varies significantly through the area. The minimum land subsidence rate is about 1 cm per year, the maximum subsidence rate is 16 cm per year (Marfai & King, 2008c).

Beside the land subsidence, Semarang is coping with seawater tidal flooding. This has an impact on the community, households, individuals and industries (Marfai et al., 2008). It also causes a threat for the city development in coastal rural areas. The seawater tidal flooding combined with the high land subsidence rate, causes a high flood risk. Because of this, people living in the coastal areas are influenced; either they have to live with the higher flood risk or they have to move.

Beside the above mentioned influence of the higher flood risk, the people living in coastal areas experience an ongoing threat of tidal flooding (Marfai et al., 2008). This threat can influence

their daily behavior and the behavioral decisions of people living in the flood risk areas. For example, if people feel a social pressure to perform certain behavior, like moving out of a flood risk area, it can influence their actual behavior. The behavior of people living in the coastal area will be analyzed with the theory of planned behavior (Ajzen, 1991). This theory consists of three predictive factors, the intention and the actual behavior of people. These predictive factors that can influence the behavior of people are the attitude, the subjective norm and perceived behavioral control of people. The analysis of the behavior of people living in coastal areas takes these factors into account.

The local government of Semarang has taken several measures related to the tidal inundation and the higher flood risk. These measures can be divided into structural and non-structural measures (Marfai & King, 2008a). Structural measures are improving the dykes, the drainage system, the pump station and the polder system and reshaping the land surface and land reclamation (Marfai et al., 2008). Non-structural measures focus on public education, the organization of disaster management and coastal planning and management whereby neighborhoods can be improved (Marfai et al., 2008; Marfai & King, 2008a). These non-structural measures can be taken at national, provincial and district level.

Furthermore, the relationship of citizens with the local government is also important (Marfai & King, 2008c). The policy of the government and the behavior of people influence each other. When formulating the government policy, the behavior of people should be taken into account. A positive reaction of people (seen in their behavior) due to the policy of the government stimulates the regarding policy; on the other hand, a negative reaction on the policy can have a policy change as a result. Moreover, policy that supports the physical adaptations of citizens against the tidal floods, for example elevated houses and making small dams, stimulates people to protect their own property. This way, the government and citizens both take measures to protect Semarang from the water. Nowadays, the government seems to focus mainly on defining the problem and preparing, determining and implementing the policy, since it focuses on (non-)structural measures. However Hoogerwerf and Herweijer (2008) plead for a broader focus wherefore they developed a policy process that could be followed. This policy process takes the reaction of citizens into consideration; this should have a better policy as a result.

1.2 Aim and research question
In this paragraph are the aim and the research question of this research explained and described. Both are derived from the framework which describes the current situation in Semarang.

Aim

The aim of this research is understanding a possible discrepancy between the policy and the behavior of people in coping with flood risks through land subsidence and sea level rise in Semarang, whereby the perception of inhabitants of the flooding areas is taken into account.

Research question

As mentioned before, there is a high risk of flooding in Semarang. Due to the land subsidence and the rising sea level, this flood risk is increasing. People living in this area and the government both react to this development. This result in the following research question:

In which way do the people and the government cope with higher flood risk in Semarang, due to land subsidence and the rising sea level, and is there a discrepancy between this policy and the behavior of the people of Semarang?

To answer this research question, there are three sub questions formulated that will assist the research question:

1. What is the response of the population living in the flood risk vulnerable area on the higher flood risk in Semarang?
2. What is the flood policy of the government of Semarang and how is this implemented?
3. What is the discrepancy between the policy of the government and the behavior of people in Semarang?

1.3 Relevance

Societal relevance

This research gains insight into how people cope with land subsidence; how people move (mobility of people), how they live (livelihood) and how they react to tidal inundation. This can be used in policy designs, whereby a more holistic view of the society will be formed. Nowadays, the local government seems to focus on defining the problem and preparing, determining and implementing the policy. The reaction of the people living in this area is not included. However, the compliance and evaluation of the policy are just as important as preparing, determining and implementing the policy. By forming a policy according to the policy process, it will be more connected to society and can be better implemented. There will be less resistance in society if certain policy has to be implemented.

Scientific relevance

As mentioned before, the government of Semarang does not look at the reaction of people when they implement their policy but they should do this since it is important. Moreover, it is important to know what the influence of land subsidence and flood is on people, society and policy. However, there is not much literature about these subjects and their interrelation. This will be investigated in this research.

The scientific relevance of this research lies in forming the relation between the behavior of people and the policy of the local government. It is important to know their relation since they influence each other with their actions and results. By linking the theory of planned behavior and the policy process to each other it is possible to relate the theories to each other. Comparing these two theories makes it also possible to notice the shortcomings of each of them. Moreover, through this interrelation the theories can be further developed and expanded. This can be done with a content analysis of the taken interviews. A comparison of the two theories, supported by the results, will uncover which factors are important for this relation. By taking the behavior, behavioral decisions and intention of people into consideration, a more complete and holistic policy can be formed. This may be used in Semarang but it can also be applied in other cities with the same problems.

1.4 Structure

In chapter 2 the theoretical framework will be explained. Core concepts as land subsidence, flood and sea level rise will be elaborated, just as the theory of planned behavior and the policy process. Following in chapter 3 the methodology; the reasons for choosing content analysis for this thesis will be explained. Furthermore, the research area Semarang will be described supported by several facts. Chapter 4 gives an overview of the results, the behavior of people and the policy of the government is analyzed. Then in chapter 5, the results are related to the two theories. Moreover, the two theories are linked to each other supported by the results. Finally there will be the conclusion in chapter 6. In here the research question will be answered and there will be a reflection on this research.

2. Theory

In this chapter the theoretical framework is described. First land subsidence, floods and sea level rise are clarified. The causes and consequences of these topics and the prediction of prospective development regarding the subsidence and sea level rise are mentioned. After that, the following two paragraphs are about the theories that will be used to answer the research question. First the theory of planned behavior is explained then the policy process. The reasons for choosing these theories is explained by relating them to the coastal areas of Semarang and the local government. Finally, the relations between the two theories are clarified and this is summarized in the conceptual model.

2.1 Land subsidence and flood

As mentioned in the introduction, Semarang is coping with land subsidence and tidal flooding. In response to this, the government has to take measures; they have to lower the risk for flooding. In this paragraph the land subsidence and the flood with which Semarang is coping are described and the relation between these topics are explained.

Land subsidence

The coastal area of Semarang is coping with land subsidence. The rate of this varies: the minimum land subsidence rate is about 1 cm per year, the maximum subsidence rate is 16 cm per year (Marfai & King, 2008c). Though, the land subsidence rate is mostly between 2 and 10 cm per year. Between 1997 and 2000 the rate was relatively higher than in 1995 and 1996. This increase is caused by the residential growth, industrial expansion, agriculture in the lowlands and an increased groundwater extraction (Marfai & King, 2007; Marfai & King, 2008c). It is expected that the area affected by land subsidence will increase in the future: a larger area will be affected and the ground level will decrease (table 2.1). It is predicted that the subsidence will be more severe in the future due to the growing size of the urban area and the growing population.

Year	Elevation below sea level (cm)				Total
	0–50	50–100	100–150	150–200	
2010	328.5	31.5	2.0	–	362.0
2015	1162.0	187.0	25.0	3.5	1377.5
2020	1464.5	607.0	128.0	27.5	2227.0

Table 2.1 – Expected future land subsidence in Semarang (in hectare) (Marfai et al., 2008)

There are several causes of land subsidence; it can be naturally or caused by human activity. Firstly, the natural land subsidence, this can be a collapse of a mine or limestone or the natural

consolidation of sediments in the ground (Hasan, in Marfai & King, 2007). Beside this natural occurring, the collapse can also occur through the influence of human activities, for example the building of tunnels, wells and covered quarries (Marfai & King, 2007). Secondly, building loads and constructions can also influence land subsidence. Building loads on a layer of clayey sediments can cause a lowering of the ground (Rahardjo, 2000; Marfai & King, 2008c). Thirdly, land subsidence can occur through groundwater withdrawal. The groundwater extraction exceeds the quantity of natural refill (Marfai & Hizbaron, 2011). Furthermore, groundwater withdrawal changes the fluid-pressure, mainly that of the layers of sedimentary and clay materials. The groundwater is needed for drinking water for households and for industrial and commercial use (Rahardjo, 2000).

As mentioned above, groundwater is needed for domestic, industrial and commercial use. This groundwater withdrawal has risen significantly over the years. For domestic use shallow groundwater is extracted from a depth of 10-40 m (Marfai & King, 2008c). Small-electrical pumps or buckets are used to transport water from dug wells. The exploitation of groundwater for domestic use in Semarang increased from 0.4 x $10^6\,m^3$/year in 1990 to 35.6 x $10^6\,m^3$/year in 1998 (Japan International Cooperation Agency, 2003 in Harwitasari & Van Ast, 2011).

Industries use deep groundwater extraction, which is more than 40 m deep. The extraction of groundwater in Semarang for industrial use has also risen significantly over the years (figure 2.1). The increase of groundwater extraction for domestic, industrial and commercial use, made the total extraction increase. In 1995 was the total demand for water 57.3 million m^3 per year and 2000 was this 76 million m^3 per year (Public works department, 2000 in Marfai & King, 2008b). This increase is correspondent with the urbanization rate and population growth in Semarang (Harwitasari & Van Ast, 2011). In short, that means that it is expected that both land subsidence and groundwater withdrawal will increase in the future due to an growing urban area and an increasing population.
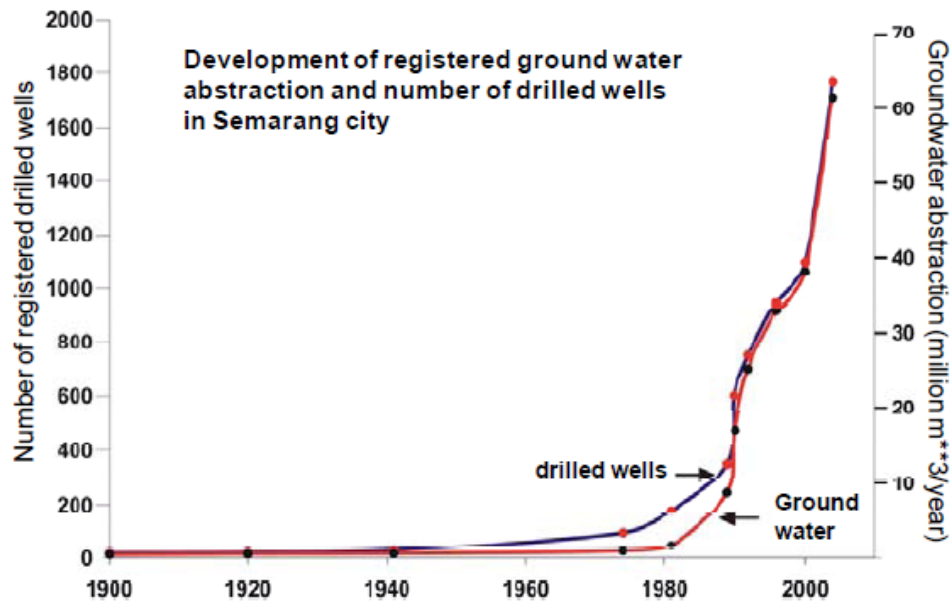
Figure 2.1 – Development of groundwater extraction and drilled wells in Semarang (Murdohardono et al., in Abidin et al., 2010)

Floods

Beside coping with land subsidence, Semarang is coping with floods. As a result of floods in the coastal area and the increasing land subsidence, there is a higher possibility of more severe and more frequent floods. The rising sea level is contributing to this higher flood risk. Hereafter these developments will be clarified.

Semarang is coping with three types of flooding, namely local flood inundation, river flood and seawater tide flood (Marfai & King, 2008a). Local flood occurs due to poorly functioning of the drainage system in the residential areas, mostly in the low lying and coastal areas of Semarang. Those problems mainly occur because the drainage system is inefficient and cannot cope with water excesses in the rainy season. River flood also occurs in the rainy season only due to an overflow of the river banks. Sea water tide flood occurs when the sea level is higher than the coastal lands due to the tidal oscillation. Processes as wave action, a high sea level combined with high river flows and an accelerated sea level rise play an important role. The seawater tide flood is a daily occurrence in Semarang, only with a the tidal height variation (Marfai & King, 2008c). The daily tidal inundation is mostly about 40-60 cm high (Kobayashi, in Marfai & King, 2008b). In this thesis the focus will be on seawater tide flood.

The height of the daily flooding is influenced by the land subsidence. Today, the height of the low lying area is lower than the current sea level, whereby the risk of flooding increases. Areas with an elevation of 1.3 m above sea level are vulnerable to floods; in 2007 was this vulnerable area about 2 ha (Harwitasari & Van Ast, 2011).

Beside a higher flood risk due to land subsidence, it is expected that the impact of tidal inundation will be more severe and more frequent due to sea level rise (Marfai & King, 2008b). The Intergovernmental Panel on Climate Change (IPCC) predicted an absolute sea level rise in Indonesia of 100 cm in the year 2100 due to an increase of the sea water temperature from 1.3 to 4.6 ˚C (IPCC, in Harwitasari & Van Ast, 2011). Already the sea level has risen 58 cm between 1985 and 1998, which is an average of 4.5 cm/year (Ministry of fishery and marine affairs, in Harwitasari & Van Ast, 2011). In the period of 2003-2008 was the increase of the sea level 37 cm, which is an average of 7.4 cm/year. These data about sea level rise is the absolute sea level rise. The absolute sea level rise is about changes of the total mass, the water density and the shape of the ocean basin (IPCC, 2007). Beside the absolute sea level rise there is relative sea level rise. Relative sea level rise is the local and regional distribution of the sea due to regional oceanographic responses to global warming (Nicholls & Mimura, 1998). It is the local increase of the sea level relative to the land, which is caused by ocean rise and/or land subsidence. In this thesis the focus will be on relative sea level rise. Concluding, Semarang is coping with a high relative sea level rise since it is coping with an ocean rise (see: numbers absolute sea level rise) and land subsidence.

The effect of sea level rise spatially differentiates, not only due to the regional oceanographic composition but also because of the interaction of sea-level rise with other factors. Regional settings and coastal characteristics, as lithology, geomorphology, wave climate, storm frequencies, play an important role (Gornitz, in Marfai & King, 2008b). Sea level rise has several physical impacts. Barth and Titus (in Nicholls & Mimura, 1998) mention coastal erosion, inundation and displacement of wetlands and lowlands, increased coastal storm and damage, and increased salinity of estuaries and aquifers.

As was already mentioned, the flooding in relation to the high land subsidence rate and the sea level rise, causes a higher flood risk. It also results in a fast broadening of the flood prone areas (Harwitasari & Van Ast, 2011). This higher flood risk makes people living in the coastal area more vulnerable for floods. People living here experience an ongoing threat of tidal flooding (Marfai et al., 2008). It has impact on the community, households, individuals and the industry which influences their attitude towards the sea (Marfai et al., 2008). Hereby social, economical and environmental surroundings are affected (Harwitasari & Van Ast, 2011). It also causes a threat for the city development in coastal rural areas because coastal buildings and infrastructures, like roads, the airport, the central station and the harbor, are regularly damaged through the tidal flooding (figure 2.2).

Figure 2.2 – Inundated road and inundated houses (Marfai & King, 2008a)

2.2 Theory of planned behavior

The reaction of people on land subsidence, tidal inundation and sea level rise is important for the policy of the government. By analyzing the behavior of people the government can relate these reactions to the flood policy; this way it will be possible to make a better policy. If the policy is not implemented the right way, it is possible to reformulate this according to the behavior of people. This way it may be possible to formulate a policy that can be better implemented. The theory of planned behavior (TPB) is used to explain the behavior of people. This theory can be used to explain different kinds of intentional behavior whereby the behavior of people living in coastal areas can be explained.

According to the TPB, the intention of people to perform behavior has a direct influence on their actual behavior (Bamberg, Hunecke, & Blöbaum, 2007). Intention is weighing the pros and cons before a person decides whether or not he should perform behavior. The stronger the intention towards certain behavior, the more likely is its performance. The intention of behavior is influenced by three predictive factors: attitude toward the behavior, subjective norm and perceived behavioral control (figure 2.3).
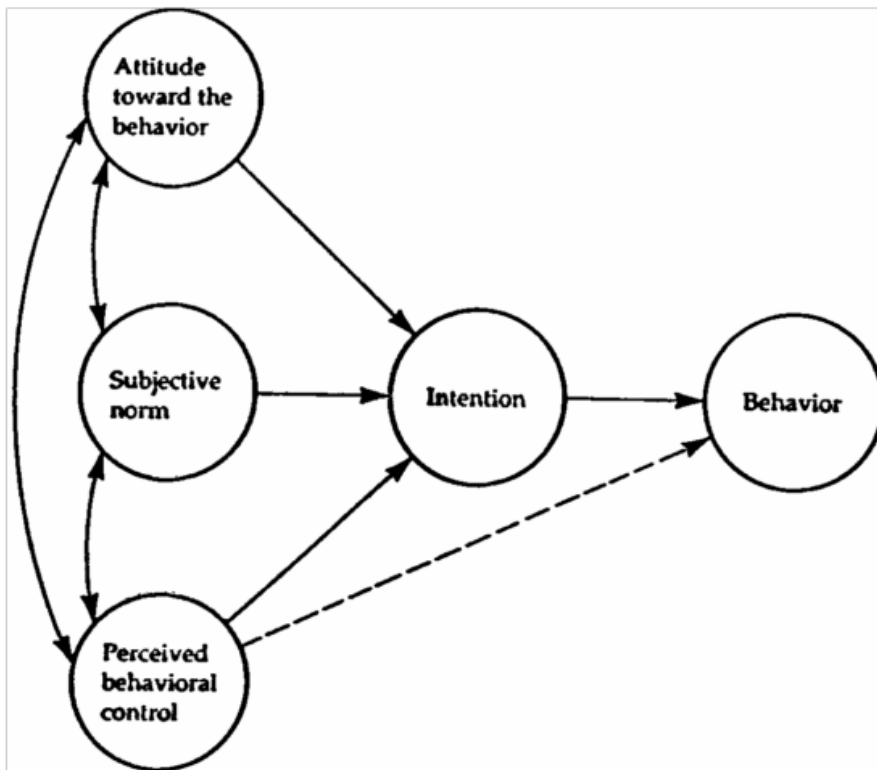
Figure 2.3 – Theory of planned behavior (Ajzen, 1991).

Firstly, the attitude towards behavior; this is the feeling of preference towards behavior. Attitude encompasses the ideas of a person about the positive and negative consequences of (possible) behavior and weighing those consequences (Bamberg et al., 2007). Every individual makes different considerations (Ajzen, 1991). Secondly, the subjective norm is the social pressure one feels to perform or not to perform certain behavior. It is the expectation of the social environment that a person feels when he has to perform behavior. Thirdly, perceived behavioral control focuses on controlling and implementing behavior. The possibility to act is a major factor here. Furthermore, perceived behavioral control has also a direct effect on behavior. This is, in the case of Semarang, a significant factor. It may be possible that people living in the vulnerable areas want to move due to the higher flood risk (attitude and intention). But if these people do not have the opportunity or the resources to move, they have to stay in the area (perceived behavioral control). Whereby they are stuck in the higher flood risk areas. That is, in Semarang there is a large gap between poor and rich people, whereby there is only a small group of rich people. The majority of the population is poor; officially 3% of the people lives in absolute poverty (Rahardjo, 2000). According to Radhardjo (2000) other sources estimate the poverty around 25% of the population, this includes absolute poverty and near poor. Thus, in Semarang it can be the case that people may have the intention to perform certain behavior only they cannot perform this behavior due to lack of opportunities or resources. This lack of opportunities and resources in

Semarang may strengthen the importance of the relation between perceived behavioral control and the actual behavior of people in Semarang since this is a restrictive factor. In Europe the perceived behavioral control has less influence on the actual behavior since most individuals already have the possibility to perform behavior. Here it is not a restrictive factor. This is an important note that should be kept in mind.

There is a positive relation between these three predictive factors, the intention and the actual behavior. The stronger the presence of the three predictive factors, the stronger the intention and the actual behavior will be (Ajzen, 1991). The importance of attitude, subjective norm and perceived behavioral control varies between situations. In some situations it may be that the attitude has a significant impact on the intention, while in another situation attitude and perceived behavioral control have a significant impact. The difference in importance of the perceived behavior control between Europe and Indonesia that was explained before, is an example of this.

A disadvantage of the TPB are the assumptions people make before they perform certain behavior. People may not be aware of the considerations they make before performing behavior. Therefore it is not clear if they choose certain behavior and also which choices they make before performing behavior. That is, the attitude and the subjective norm are not really apparent when people make a decision. They are more underlying decisions people make of which the researcher is not aware. Though, perceived behavior control can be apparently present when people make a certain decision since it is more identifiable. In short, these considerations should be taken into account when applying the TPB.

In Semarang, the attitude, the social norm, the perceived behavioral control and the intention are important factors that influence the behavior of people living in vulnerable areas. People's view on the flood risk, their coping with the tidal flooding and their resources are important. If people in the coastal area do not experience a higher flood risk and they cope well with the current flood, then there is a considerable possibility that the people stay in the area because they do not have the intention to move to another area. Another possibility which makes people stay in the area are the social contacts they have here; their family, friends and neighbors all live here and this makes the area favorable. This does not mean that the people here feel a negative social pressure to stay this can also be a positive pressure.

By analyzing these three predictive factors, the intention and the behavior of the people living in the coastal area should become clearer. Moreover, if the government wants to influence the behavior of people, the motives of behavior should be analyzed. This way it is possible to make more effective policy measures. When the government knows the motives of people to stay

or move out of the area, it can adapt its flood policy to this. If people stay in the area the government has to take this into account. This way it has to protect the people from the flood with flood prevention, like dikes, dams or a drainage system. If people move out of the area, the government still has to have flood protection and a flood policy but there are more possibilities for the policy design. A form of flood protection can be the controlled overflow of a part of the coastal area because dikes and dams have limited protection. If the water level is too high, it cannot protect the inhabited area. Having an indicated overflow area, can protect the people living here.

As was discussed before, if the behavior of people is been taken into account, the government can adapt its policy to this. Therefore if the behavior of people in the coastal area is linked to the policy process it should make a better flood policy.

2.3 Policy process

When formulating the flood policy of Semarang, land subsidence, tidal inundation and sea level rise should be taken into account. Before this is possible, the current flood policy should be analyzed. For this analyze a policy process is used. This process focuses on the different stages between designing and implementing policy, which is in this case the flood policy. The policy process of Hoogerwerf and Herweijer (2008) is used to analyze the policy of Semarang. They define the policy process as 'the process of formulating demand and support into government policy' (Hoogerwerf, 2008). The focus is on the development of actions, arguments and interaction around policy. This is used to find a (possible) discrepancy between the policy design, the policy implementation and the behavior of people. Furthermore, if needed, it can be used to propose changes in the current policy of the government of Semarang.

The policy process consists of six stages: agenda development, policy preparation, determination, implementation, compliance and the evaluation. These stages will be explained here. Firstly the agenda development, here a social problem gains the attention from the public and/or policy makers. Through several ways it is possible to put the social problems on the agenda (Akkerman & De Vries, 2008). In Semarang these problems are the higher flood risks due to land subsidence and the rising sea level. Secondly policy preparation, through several steps the policy is contemplated, substantiated and formulated (Hoogerwerf, 2008). Rationality and legitimacy are important values in this stage. The third stage is determining the policy; in this stage, the content of the policy is determined. Fourthly, the implementation of the policy; this focus on instruments one wants to use to reach the desired goals (Coolsma, 2008). After the implementation follows the compliance; in this stage the focus is on the compliance of the policy and the behavioral norms (Van de Peppel, 2008). The policy process is closed with an evaluation

of the policy. The policy is judged on the content, the process and the effect of the implemented policy (Bressers, 2008). On basis of the evaluation is concluded if the policy had the desired results.

It is important to note that this policy process is an iterative process instead of a linear process. Whereby the different steps that are described here, are probably not followed in this order since it is an interactive process. There are also some restrictions when formulating the policy process by the rules and the law that should be followed.

In this thesis the current policy of Semarang will be evaluated. This will be done by analyzing the current flood policy, instruments that can be used to implement this policy and also the people who implement it. The individual plays an important role in this process. Citizens can cope with the policy that the government has designed. They can accept this policy or they can protest against it. Beside the acceptation of citizens, civil servants have to implement the policy. A problem for the implementation of the policy in Semarang is possibly the corruption that it faces. Corruption can be measured by the Corruption Perception Index. This index shows how much money goes to where it should go, while the remaining amount of money goes elsewhere. Which means that only part of the intended money will be used. In 2011 Indonesia has scored a three on a scale from zero to ten, whereby it is ranked at position 100 out of 182 (Transparency international, 2011).

The policy process of Hoogerwerf and Herweijer (2008) will be used to note the (possible) shortcomings of the flood policy of Semarang and to address these shortcomings. When formulating the policy of the government, the behavior of people should be taken into account because the behavior of people and the policy of the government can influence each other. Therefore, by formulating the policy according to the policy process and by taking the behavior of people into account, it will be more connected to society and it can be better implemented.

Traditional flood policy focuses mostly on technical measures to reduce the flood risk. However, these flood risk designs are under-designed. Environmental and socio-economic changes, such as climate change and rapid city-growth, are not taken into account and there is a slow implementation of the policy (Ward, Marfai, Poerbandono, & Aldrian, 2008). This latter means that there can be a delay between the design and the implementation of the policy. This can cause a problem because the situation can be already changed whereby the policy does not fit anymore**.** By knowing the exact policy problems and by focusing on these problems, it is possible to change the flood policy efficiently and effectively. The policy process can be used to link the problem to the corresponding stage which can be used to solve the problem.

Furthermore, the flood policy should not only include environmental and socio-economic changes as is discussed above. The flood policy should also include disaster management. Disaster management aims to lower the threats from known hazards whilst maximizing any related benefits (Smith & Petley, 2009). It is not possible to eliminate hazard but threats can be reduced to an acceptable level. This way, people in Semarang will be more protected from known hazards. Crozier (in Smith & Petley, 2009) mentions the key drivers for successful disaster management, i.e. awareness of the threat, a sense of responsibility and believing that the threat can be managed or reduced. Policy makers should focus on this and on the preparedness of the community; the degree to which a community is alert to disaster. If a community is more alert, the damage and human losses can be reduced.

Concluding, there are several aspects that the government of Semarang should include in its flood policy. Technical measures combined with the knowledge of environmental and socio-economic developments should improve the flood policy. Beside these improvements, disaster management should be included in the policy. Hereby a more holistic policy can be designed. An important aspect of this improved policy, is that inhabitants of the coastal area should be better prepared for hazards.

2.4 Behavior and policy

The policy of the government and the behavior of people are influenced by each other. They cannot be analyzed independently. Therefore, the policy process and the theory of planned behavior are related to each other. In this paragraph, the relation between the policy process and the theory of planned behavior (TPB) is clarified. These relations are based on the theories and on common sense reasoning.

According to the TPB, behavior is influenced by the intention to perform behavior; this intention is influenced by the attitude, the subjective norm and the perceived behavioral control. This latter has also a direct influence on the behavior of people. The factors that influence the behavior of people are linked to the policy process. The policy process is split up into three stages: the agenda development, the policy design and the policy implementation.

The attitude can be linked to the policy design. For the policy design there are considerations made, from how the problem is approached or which instruments will be used to how the policy should be implemented. Positive and negative consequences of certain policy will be analyzed and weighed against each other. Secondly, the subjective norm can be linked to the agenda development. The social pressure of the society can make it possible that a problem gains the attention from policy makers. This way it will be put on the agenda. The subjective norm can also be linked to the policy design. Social pressure can make it possible that certain policy is preferred

by policy makers. The advantage of this, is that the policy will be better accepted once it will be implemented. Finally, the perceived behavioral control has a direct link with the implementation of the policy. An important factor of the implementation of the policy is having the instruments. If these instruments are not present there can be no implementation. This way the implementation is influenced through behavior. Moreover, the perceived behavioral control can influence the agenda development. People can use their opportunities and resources for gaining attention for a problem, hereby the agenda development is influenced.

Beside the influence of behavior of people on the policy of the government, the policy of the government can influence the behavior of people. The government can stimulate certain behavior by making this particular behavior more appealing. An example is stimulating certain behavior through allowances or comparative tax benefits. This is in any case used in European countries and seems to be working. But it may not work in Indonesia since a requirement for these stimulation regulations is capital since the government has to have enough money to give allowances or comparative tax benefits. These kind of measures focus on the attitude of people, on the behavior of individuals. Therefore, there is a link between the policy design and the attitude of people.

This example also shows the influence that the policy design and the policy implementation may have on the perceived behavior control. By implementing a policy that focuses on giving allowances or comparative tax benefits, the opportunities and resources of people can be influenced whereby certain behavior is stimulated. This way the policy design and the implementation of this policy influences the perceived behavioral control of people.

Furthermore, the policy implementation is also related to the attitude of individuals and the subjective norm. If an individual, for example a civil servant, has to implement the policy of the government, it can influence the implementation. This can be influenced through the different perspectives that individuals have; whereby the interpretation of the implementation as well as the use of instruments can be influenced. Another factor is that if an individual does not agree with a policy measure or the instrument that is used, he can try to avoid this or change it in a way.

Also the subjective norm can be influenced through the policy implementation. If the policy is implemented by the government and supported by its citizens, it is more likely that people will promote this policy to each other. Through this way, the subjective norm is also influenced by the policy design. For example, imagine there is a new waste disposal system in Semarang which encourages people to throw away their garbage in the waste bin instead of on the floor or in the

channel. If the majority of the people participates in this system it is possible that people who do not participate in this system feel pressured to participate.

Above, the relation between the two theories are discussed. This shows that there is no relation between the agenda development and the attitude. The attitude of people focuses on weighing the positive and negative consequences of certain behavior. This consideration does not influences how a certain subject is put on the agenda and vice versa. Because the agenda development can be influenced by social pressure and the opportunities and resources people have, the consideration people make about certain behavior is not taken into account.

The relation between the Theory of Planned Behavior and the policy process is explained in the above. It can also be summarized in a graphical view, namely the conceptual model. This conceptual model (figure 2.3) shows the relations between the different theories and the flood risk.
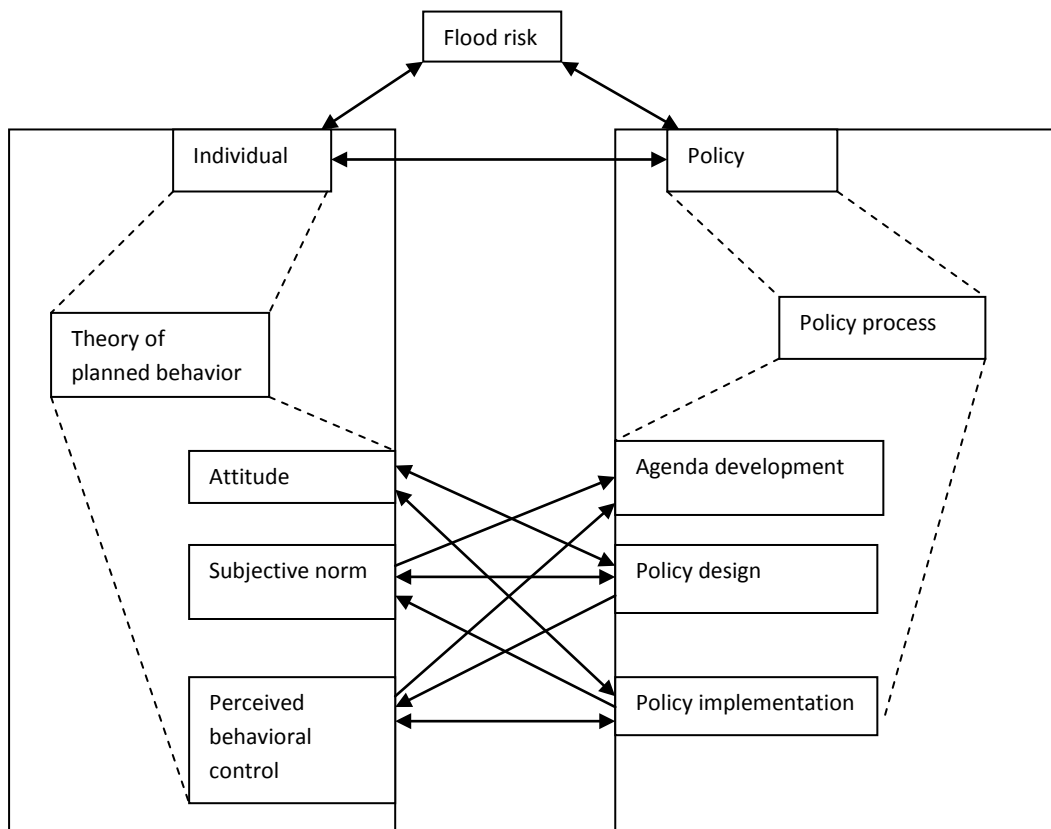
Figure 2.4 – Conceptual model

The conceptual model makes it clear that the flood risk, the individual and the policy are related to each other. Whereby the individual is explained by the theory of planned behavior and the policy of Semarang is explained by the policy process. The three factors from which the two

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theories exists of are represented by the dashed lines. The relations between these different factors of the theories are clearly shown in the model.

This interrelation is important because this way it is possible to formulate a flood policy that focuses as well on the behavior of people as on the important aspects of a flood policy. Aspects that especially should be included in the policy are the environmental and socio-economic developments that are taking place and disaster management. These aspects combined with the attitude, the subjective norm and the perceived behavioral control of people should make it possible to design a more holistic flood policy.

3. Methodology & research area

In the previous chapter, the core concepts and the used theories are explained. In this chapter the used methodology is described. The data collection and the use of the qualitative content analysis is legitimated and the reason behind these choices are elaborated.

This research is an exploratory study done by qualitative methods. This exploratory study should make it possible to gain more information about the people living in coastal areas and their reaction to land subsidence and a higher flood risk. Whereby general knowledge about people living in coastal areas and the policy of the local government can be extended which can be used by policymakers and researchers.

3.1 Data collection

The data collected of this thesis is elaborated in this paragraph. The use of interviews with experts and a literature study (secondary data) for this thesis are explained. Furthermore, there is a clarification which experts are interviewed.

The data is gathered through literature study and interviews. The literature study focuses on the current circumstances in Semarang; the land subsidence, the behavior of people living in the coastal area, policy and the policy of the local government will be outlined. This data is collected from scientific articles and books that focus on these subjects, whether it is global, national or local scale. The interviews are semi-structured interviews; with semi-structured interviews the interviewer gives the respondent space by asking open question and approaching the subject from different sides (Longhurst, 2009). The questions do not have to be formulated in advance but a topic list will slightly structure the interview. This topic list exists of important subjects that need to be discussed during the interview; these topics are land subsidence, flood, people living in the coastal areas and the policy of the government.

These interviews with experts with knowledge about people living in the coastal area and secondary data from the literature study is used in forming an image from the behavior of people. These interviews with experts are conducted through Skype, e-mail correspondence or a face-to-face conversation.

Interviews are conducted with several experts about Semarang and the policy of the local and national government (see Appendix 1). These experts are Wijanto Hadipuro from Soegijapranata Catholic University, Muh Aris Marfai from Gadjah Mada University, Retno Susilorini from the Civil Engineering department of Soegijapranata Catholic University and Johan Helmer from the '*Hoogheemraadschap van Schieland en de Krimpenerwaard*'.

Hadipuro is a founder of the NGO Amrta Institute for Water Literacy. His research focuses on the water use, water supply and urban livelihoods in Semarang. By interviewing him it is possible

to get a general view of Semarang and the water supply here. Marfai has a lot of knowledge about land subsidence, floods, the rising sea level and the behavior of people in the coastal area of Semarang. Interviewing him makes it possible to learn more about his research and makes it is possible to question him about these subjects. Susilorini is dean of the Faculty of Engineering and chairman of the Java Institute. She is reviewing the Government Project of Banger Polder Pilot Project that is running in Semarang. This is a cooperation of the government of Semarang with Witteveen and Bos, a Dutch consultancy company, and the '*Hoogheemraadschap van Schieland en de Krimpenerwaard*'. Helmer is head of the department '*Waterketen & Coordinator internationale samenwerking'*. He is involved in the Banger Polder Pilot Project in Semarang.

3.2 Analyzing method

The collected data is analyzed by content analysis. Content analysis investigates recorded communication of people (Druckman, 2005). In a text that will be analyzed communication should be present, this can be oral communication but also written texts. Content analysis is as well a quantitative as a qualitative method (Baxter, 2009). The quantitative content analysis focuses on objective observations whereby the studied phenomena are counted. It is a deductive process whereby the theory is linked to the data. For qualitative content analysis, in contrast to the quantitative content analysis, the researchers can be involved in the data collecting process, by for example interviewing respondents. Furthermore, qualitative content analysis is a inductive process whereby a theory is developed; the context of the collected information plays a role. For this research, the qualitative content analysis is applied because the researcher is involved in the data collecting process through the interviews that will be conducted. Moreover, the context in which the data is gathered is important.

For qualitative content analysis, the text is divided into smaller parts, as paragraphs, sentences or words. These paragraphs, sentences and words are coded (Baxter, 2009). The content of the text and the codes are formed in the text after which they are compared to each other and if necessary changed. This should be done in an interpretative and inductive way. The coding process makes it possible to mark the (core) subjects in the interviews. Because it is an interactive approach the codes and subjects will be interpret and related to each other. This is another reason for choosing this method, this way the interrelation between the subjects is clearly shown.

The data collected for the content analysis, is gathered from conducting interviews. These interviews are analyzed with atlas.ti, which makes it possible to code and categorize the interviews. These codes are interrelated in a network whereby the relations are clearly shown (see Appendix 2).

Finally, there will be a model designed based on the data collected from interviews and secondary data. This model includes the following factors: people in the coastal area, land subsidence, tidal flooding, flood risk, the behavior of people and the policy of the government. Especially the relation between the behavior of people and the policy will be made clear which will be supplemented by the aforementioned factors. Hereby a holistic model will be made.

3.3 Semarang

Indonesia has are large coastal area, it is more than 80.000 km long. Semarang is a coastal city in the north of Java (figure 3.1) and is seen as the centre of national development (Marfai & King, 2008b). It has a population around 1.5 million people and is growing with 2% per year (Marfai & King, 2008a). Semarang is coping with environmental problems (coastal erosion and sedimentation), over-exploitation of groundwater resources, rapid urbanization and the already mentioned land subsidence and tidal inundation (Marfai & King, 2008b). Through the rapid urbanization of coastal areas with a high population concentration, the area has an increased vulnerability for floods.

Semarang has a surface around 374 km^2 and is divided into two landscapes: lowland and coastal area in the north and a mountainous area in the south (Dewi, 2007; Marfai & King, 2008c). In the lowland the elevations range from 0 to 10 m, in the hilly area range the elevations from 10 to 453 m. The land subsidence generally occurs in the north, the low-lying area (around the 120 km^2), where the city centre is developed. The city centre is mostly located above sea level. This area also consists of residential, office, retail, public use and open space areas (Abidin et al., 2010). The northern part of the city, the hilly area, has relatively more industrial and business areas then the southern part; the population density is higher in this northern area.
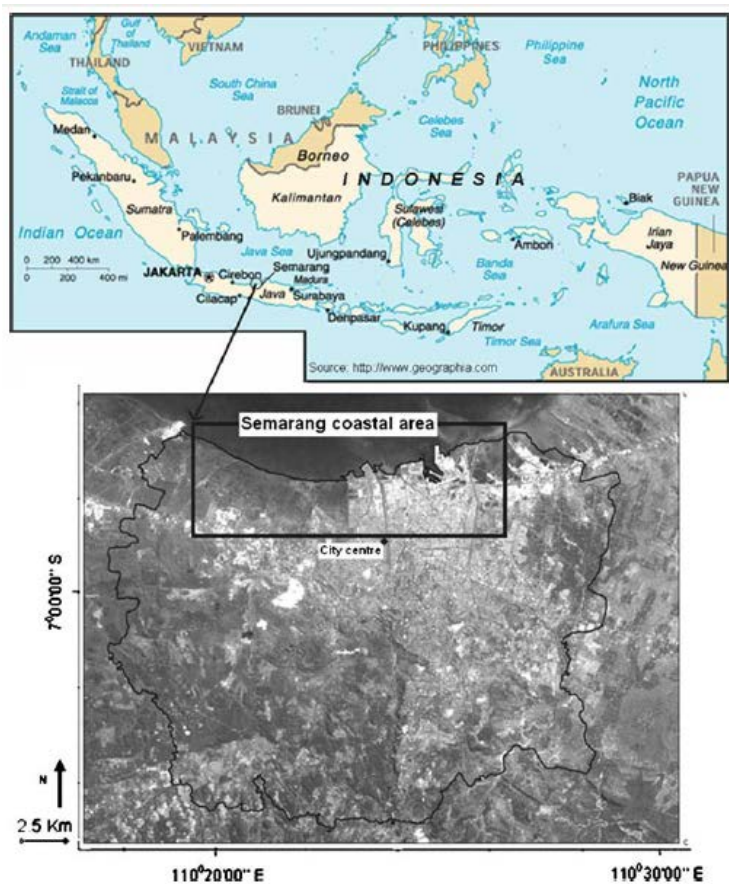
Figure 3.1 – Semarang (Marfai et al., 2008)

Land use

Above a general and physical description of Semarang is given. Another important aspect that should be examined is the land use in the area since this is influenced by the land subsidence and flood. The land use shows the (possible) vulnerability and the economic value of an area; for disaster management it is important that there is knowledge about this.

Land use is influenced by several factors like the geographic position, topography, elevation and available infrastructure. Especially infrastructure is important, as people find areas with more sufficient infrastructure more attractive to live (Dewi, 2007). This is often the case in urban or suburban areas. Beside the factors which influence the land use, there can be four types of land use distinguished: agricultural and plantation areas; bare land, beach and yard; built up area (such as buildings); and fishpond area (Marfai & King, 2008b). Built up area and fishpond area are most vulnerable to coastal inundation and they are of most economic value that could be lost when inundated.

The coastal area of Semarang is mostly developed for residential, recreational and industrial purposes (Marfai & King, 2008a). Here the industrial estates are situated, the economic activities occur and the population and coastal urban development in this area are growing. Beside

developments in the coastal area, there are also developments in the southern part of Semarang. In the last ten years, the agricultural area is replaced for a built up area. Concluding can be said that the past ten years in Semarang, the land use changed from agriculture purposes to industry and built up area and households (Marfai & King, 2007).

Coastal area

The northern part of Semarang is coastal area. In this area there are twenty villages which are most vulnerable to inundation (figure 3.2). The population of these villages differentiates, depending on the distance towards city activities, like harbors or the city centre. Villages closer to the city centre have more inhabitants (Marfai & King, 2008b). In total there are more than 148,000 people living in these villages.

All these twenty villages suffer from the tidal inundation and land subsidence. Though, there are six villages that suffer the most; these villages are: Tambakharjo, Tawangsari, Panggung Lor, Terboyo Kulon, Bandarharjo and Tanjung Mas (Marfai & King, 2008c). These villages are indicated in figure 3.2 (displayed as purple circles). About 70,000 people are living in these villages (Statistic Bureau Semarang, in Harwitasari & Van Ast, 2011). Though, this research does not study all these villages; the villages that were studied in this research are also indicated in figure 3.2 (displayed as yellow circles). This shows that all the studied villages lie in the eastern coast of Semarang.
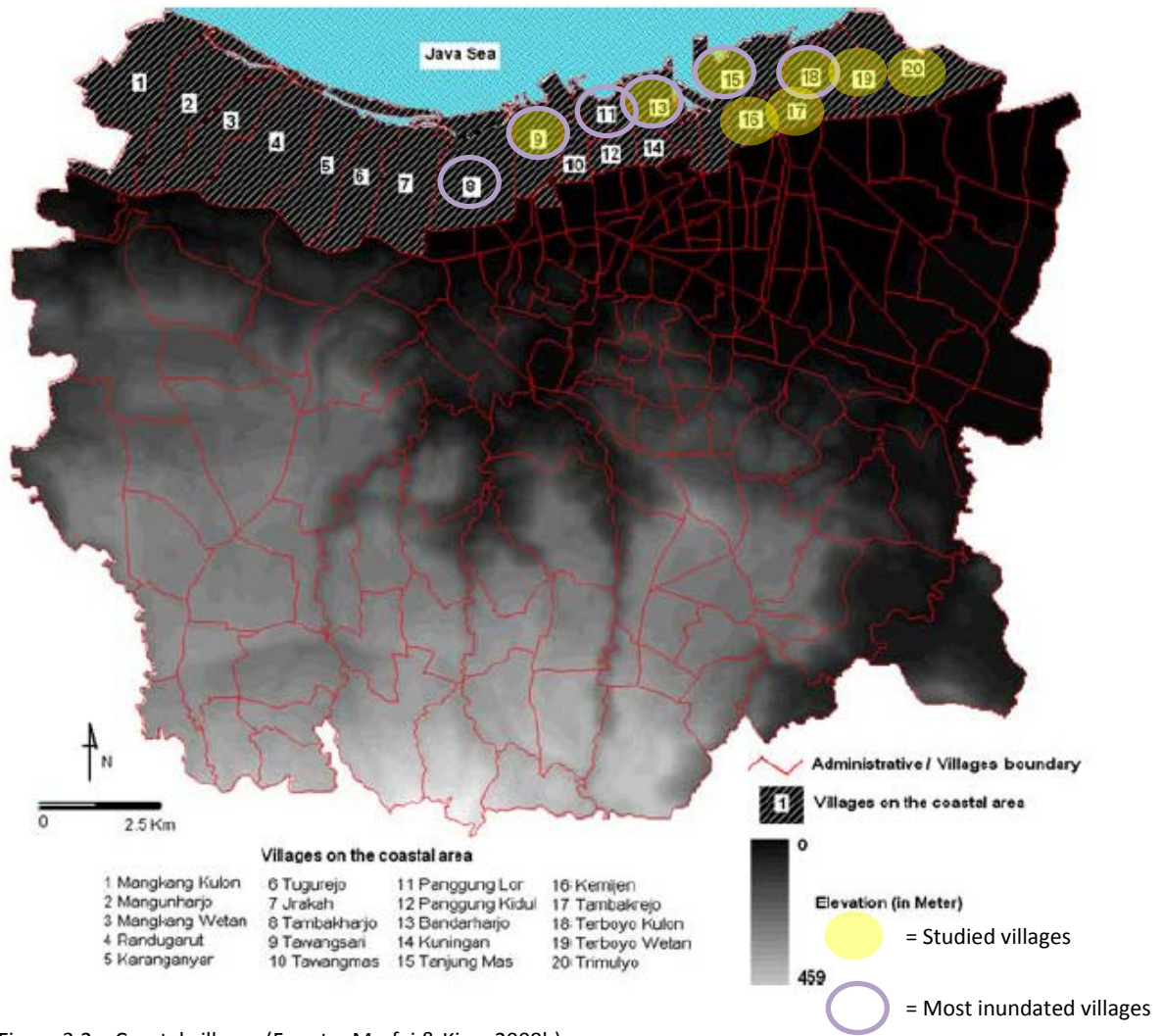
Figure 3.2 – Coastal villages (Free to: Marfai & King, 2008b)

4. Results

In this chapter the results of this research are described. The experience of both the inhabitants and the government with the flood and the increased flood risk are clarified. The experienced flood risk and the coping strategies of inhabitants of several coastal villages are illustrated and compared to each other. Hereby the perception of the flood duration and the flood depth of inhabitants is included, since this influences their coping strategies. After that, the policy of the government follows. Measures that the government already has taken are mentioned, just as some problems with the implementation. There will be an emphasis on the corruption in Semarang.

4.1 People

People living in the coastal area are aware of the constant flood threat in the area. They experience a constant threat for flooding which can influence their daily activities. In this paragraph the perception of the tidal flood and the coping strategies of people in the coastal area are explained. This perception determines how people experience the flood and it can influence the copings strategies. It is expected that people who experience a deeper flood depth and a longer flood duration, make more adaptation to their house than people who experience a less deeper flood depth and a shorter duration. Because this way they are better protected from the flood. The used data here, is only based on the perceived tidal flood since there is little data present of the actual amount of flood. Despite the tidal flood, people have their reasons for staying or moving out of the area are clarified. There are several reasons for people to stay in the area; reasons are mostly the lack of capital, a short home-work distance, owning an inherited family house or a property here or they expect to compensate the flooding with adaptation measures (Harwitasari & Van Ast, 2011). There are also several reasons for people to relocate, namely to avoid the flood, for safety reasons, the option to rent a house elsewhere or the high costs of flood prevention and protection.

In the previous chapter was already mentioned that there are six coastal villages which are most inundated. These villages are Tambakharjo, Tawangsari, Panggunglor, Terboyo Kulon, Bandarharjo and Tanjung Mas; four of these villages were studied by researchers. The studied villages and the gathered data from these studies are described in this paragraph. Beside these four villages there are several other villages described; only they are not part of the most inundated villages. All the studied villages lie at the eastern coast of Semarang (see figure 3.2). In this area the land subsidence is the greatest (Marfai & King, 2008c). The people living in these flood risk areas have to cope with the flood. Below, three types of coping strategies are mentioned.

There are several coping strategies for people living in flood risk areas, according to Blaikie et al. (in Dewi, 2007, p.46) there are three types of coping strategies: before, during and after the flooding. Each of these types have different features. Examples of coping strategies before the flood are focused on safeguarding people's property by elevating the house, elevating the garden, constructing the house with reinforced material or building a small dike (figure 4.1 and 4.2). Furthermore, people can raise their doorstep so the house is protected from water coming inside (J. Helmer, personal communication, 1 June 2012). Also safeguarding the basic food provision as rice and sugar, preparing a temporary place with relatives or friends and patrolling in the neighborhood are features of coping strategies before the flood (Dewi, 2007). Furthermore, people can take measures during the flood, like evacuating persons (children and elderly) and belongings, closing the doors and windows, draining the house and guarding the house to make sure their belongings are safe. It is also possible that people continue with their work or do not take measures. There are also measures taken by people after the flood; this can be repairing or cleaning the house and the surroundings, looking for an alternative place to live and patrolling in the neighborhood. This literature study mainly focuses on coping strategies before the flooding unless otherwise mentioned.

Figure 4.1 – Small dam in front of the house (Marfai & Hizbaron, 2011)

Figure 4.2 – Elevating the house (Marfai & Hizbaron, 2011)

Marfai et al. (2008) did research on the population of Bandarharjo and Tanjung Mas. These are the most populated villages of the coastal area. Their research was concerned with the way people in the villages experienced the flood threat and how this impacts their daily life. They found out that people living in these villages are aware of the fact that they live in a flood risk area. Beside awareness, they also experience a threat of tidal flooding in the area. Even though this is the case, they have several motivations for staying in the area. Mostly people stay in the area due to lack of capital (65%). Other reasons are the accessibility to the city centre, industrial estate, public facilities and their jobs (25%). The remaining people (10%) stay in the area because they value the culture and they were born here.

People perceived the tidal flood depth and the duration of the flood differently. Most people perceived the tidal flood depth as 25-50 cm (46%), while other people thought the tidal flood depth was less than 25 cm (27%) or 50-75 cm (23%). Most people thought the duration of the flood was three to six hours (54%); 32% of the respondents thought it was less than three hours.

The tidal flood has an impact on daily activities, such as working and domestic activities. Most people can continue with their daily working (53%) but some cannot (43%). Opposite to this, most people cannot continue with their domestic activities, like cooking (80%) and washing (65%). This obstruction of daily activities can be because roads are blocked and public services (water supply and electricity) cannot be used. This way the perceived behavioral control of people is influenced. Hereby it may be the case that they cannot perform behavior due to circumstances they cannot influence.

Due to the tidal flooding, people have taken several measures to protect their houses. These adaptations are income dependent. Therefore not everybody can make the adaptations that are needed to protect their house. The amount of income is thus a perceived behavioral control-factor. Even though they may have the intention to adapt their house if they have a lack of capital it is not possible. Thus the perceived behavioral control determines whether adaptations can be made or not. Adaptation methods that people apply in the area are raising the garden level (87%), elevating the house (75%), raising the floor level above water level (64%) and making a small dam to prevent water from entering the house (60%) (Marfai et al., 2008). Beside these household adaptations there are also adaptations made in the neighborhood; the street level is increased, the drainage system is improved and dykes are build.

The villages Terboyo Wetan and Trimulyo were also investigated, these villages are not part of the six villages with the most problems but they do lie in the coastal area. Marfai and Hizbaron (2011) studied these villages. For this study they used the same questionnaire as Marfai et al. (2008) used for their research. Also the people living in Terboyo Wetan and Trimulyo are aware of the threatening of the tidal floods in the area (Marfai & Hizbaron, 2011). Despite this, people stay in the area; this is mostly because they have no alternatives due to the lack of capital (55%) but also because of the accessibility to the city centre, industrial estate, public facilities and their jobs (38%). Here, the attitude and the perceived behavioral control play a role whether certain behavior is performed or not. The attitude is present if people make a consideration between the accessibility and the inundation. Hereby are the positive and negative consequences of staying in the area taken into consideration. The perceived behavioral control emerges due to the lack of capital whereby people have little alternative places to move.

Just as was the case in Bandarharjo and Tanjung Mas, people perceived the flood depth and the flood duration different. Most people perceived the tidal flood depth as 50-75 cm (45%) and some people thought it was 25-50 cm (30%). The duration of the flood was viewed as three to six hours (45%) or six to nine hours (30%). The daily activities in Terboyo Watan and Trimulyo were influenced by the tidal flood but this influence was not as great as it was in Bandarharjo and Tanjung Mas. The daily working and the cooking of people could generally continue. Only the washing was more influenced by the flood (17%) although this influence also is much lower than in Bandarharjo and Tanjung Mas.

Also, in Terboyo Wetan and Trimulyo are several adaptations made to the houses to prevent it from flooding. Adaptation methods are raising house-properties to a water-safer place (32%), raising the garden level (29%), raising the floor level above water level (24%) and making small dams to prevent water from entering the house (17%). Economic and social economic factors influence these adaptation methods.

Harwitasari and Van Ast (2011) did research on people experiencing the floods and their (future) adaptation strategies. Of the six villages that were most inundated, they investigated Tawangsari, Terboyo Kulon and Tanjung Mas. People experiencing the flooding are mostly influenced by the flood four to nine times a month (50%), only 10% of the respondents is daily influenced. The duration of the flood is by the majority of the people experienced for only one day (85%). People mostly experience the flood depth as less than 50 cm (70%), 28% of the people experienced the flood depth between 50 cm and 1 m.

Inhabitants of these villages are not planning to move out of the area, they want to stay here even though they have to cope with the flooding. This is mostly because of financial reasons. The perceived behavioral control is the limiting factor to perform behavior since there is a lack of opportunities and resources. Because of the lack of capital, people have to adapt their house or the neighborhood. Adaptation methods are elevating the house (21%), raising the floor level (21%), raising the garden level (13%) or building a dam (8%). Most people have made one or more adjustment to their house (88%). The adaptation methods that are mostly combined are elevating the house and raising the floor level. Most of the inhabitants also participate in the neighborhood protection, this way the house will be indirectly protected from the flood. These measures can be the elevation of the street level, improving the drainage system, making dykes or providing pumps.

The people living in the flood area may have been partly compensated by the government for adaptation costs they had to make on their house. Though, researchers are ambiguous about this. According to Marfai there is no compensation measure of the government; the government

mostly focuses on spatial planning (M. A. Marfai, personal communication, 23 April 2012). While Harwitasari and Van Ast (2011) say that people get compensated, though it is not clear how much the total sum of the compensation was. This amount of compensation for inhabitants would depend on their financial situation and the amount of damage done by the flooding.

Beside the aforementioned villages, the villages Kemijen, Tambakrego, Mlatibaru, Mlatiharjo and Kaligawe were also investigated (Dewi, 2007). Therefore, the coping strategies of people living with a flood threat were studied. According to Dewi, most people (64%) prefer to stay in the area due to ancestral properties (45%) or because they own a property (38%). Other reasons are accessibility to their jobs, a cheap living environment, a friendly neighborhood, accessibility to business and access to education. It is also possible that people have more than one reason to stay in the area. If people want to move (35%), this is because they want a safer location to live.

The perceived flood depth in the area varies. Most people experience a flood depth between 0.5 and 1 m (69%), other people perceived the water level as less than 0.5 m (17%) or more than 1 m (15%). Most people experience that the size of the flood is getting higher every year. The perceived flood duration also varies in the coastal area. Mostly people experience a flood duration of three to seven days (74%); 4% experienced a flood duration of less than a day, 18% of the people experienced a duration of one to two days and the other people (5%) experienced a duration of more than seven days. Combining these two elements, people mostly perceived a flood between 0.5 and 1 m that had a time span of three to seven days.

Half of the respondents cannot continue with their daily working activities when the flooding took place. This can be because of a road disruption, bad work accessibility, flood depth, people taking care of their family or their property or because they do not want to leave the house alone in case a larger flood will come. The rest of the respondents can continue with their work (40%), though this is for some people only partial (10%).

Dewi (2007) is the only researcher who focused on coping strategies before, after and during the flooding. He looked at the flood perception of people and their coping strategies. Most coping strategies were done before the flooding, followed by strategies after the flooding and, finally, during the flooding. Inhabitants used the different adaptation methods mentioned in the introduction of this paragraph, especially the social network is important. There are several social coping strategies to reduce the (possible) negative effects of the flood, like patrolling in the neighborhood, helping other community members in doing work and cleaning the area after a flood. These activities can strengthen the relationships in the community. These adaptation methods are partly connected to the subjective norm; the subjective norm mostly focuses on the

social pressure ones feel to perform certain behavior. This pressure may not be present here but the social environment makes it possible for people to stay in the area. Furthermore, structural coping mechanisms are also frequently done in the investigated area. An example is constructing and repairing the house with reinforced materials and cleaning the canal that's near the house. Beside the social network and the structural coping mechanisms, Dewi (2007) observed that people with relatively more capital were capable to construct their house with more durable materials.

Comparison

These different studies can be compared to each other. Though, it is hard to compare several results due to differences in measurements. Therefore it is difficult to compare the flood duration results of Marfai et al. (2008) and Marfai and Hizbaron (2011) and Harwitasari and Van Ast (2011) and Dewi (2007). The first looked at a flood duration of hours while the latter looked at a duration of days (table 4.1). This results show that the inhabitants of Terboyo Wetan and Trimulyo experienced a relative longer flood duration than inhabitants of Bandarharjo and Tanjung Mas, while the inhabitants of Kemijen, Tamkrego, Mlatibaru, Mlatiharjo and Kaligawe experienced the longest flood period. In short, there can be said that the inhabitants of the coastal villages all experience the flood duration different, this can range from less than three hours to more than seven days.

Villages	Bandarharjo & Tanjung Mas	Terboyo Wetan & Trimulyo		Tawangsari, Terboyo Kulon & Tanjung Mas		Kemijen, Tambakrego, Mlatibaru, Mlatiharjo & Kaligawe
Flood duration			Flood duration		Flood duration	
<3 h	32	12,5	< 1 day	85	< 1 day	4
3-6 h	54	45	1-5 days	6	1-2 days	18
6-9 h	13	30	> 5 days	9	3-7 days	69
> 9 h	1	12,5			> 7 days	15

Table 4.1 – experienced flood duration (in percentage) in coastal villages

Beside comparing the experienced flood duration, the experienced flood depth between the villages can also be compared. This comparison has the same difficulty as the comparison of the flood duration, since there is a difference in measurements. Marfai et al. (2008) and Marfai and Hizbaron (2011) measured at a smaller scale than Harwitasari and Van Ast (2011) and Dewi (2007). By redefining this flood depth, the experienced flood depths can be compared (table 4.2).

This shows that 73% of the inhabitants of Bandarharjo and Tanjung Mas would have an experienced flood depth of less than 50 cm, and 27% of the inhabitants would experience the flood depth between 50 and 100 cm. For the villages Terboyo Wetan and Trimulyo it is less extreme; 40% of the inhabitants experience a flood depth of less than 50 cm and 60% a flood depth between 50 and 100 cm. This shows that the experienced flood depth is greatest (50-100 cm) in Terboyo Wetan and Trimulyo and in Tawangsari and Terboyo Kulon. People experience less flood depth (less than 50 cm) in Bandarharjo and Tanjung Mas and Kemijen, Tambakrego, Mlatibaru, Mlatiharjo and Kaligawe.

Villages Flood depth	Bandarharjo & Tanjung Mas	Terboyo Wetan & Trimulyo	Tawangsari, Terboyo Kulon & Tanjung Mas	Kemijen, Tambakrego, Mlatibaru, Mlatiharjo & Kaligawe
<50 cm	73	40	70	17
50-100 cm	27	60	28	69
>100 cm	0	0	2	15

Table 4.2 – redefined experienced flood depth (in percentage) in coastal villages

Furthermore, the adaptation methods of the people living in the different villages can also be compared to each other. Only the study of Dewi deviates from the other researchers. He investigated other mechanisms which mostly focused on the importance of the social network and structural adaptation methods. The adaptation methods people use to protect themselves for the floods are almost the same in every village (table 4.3). People elevate their house or their garden, make dams or raise the floor level. The most popular adaptation methods are raising the garden level, raising the floor level, elevating the house and, finally, making a small dam. Even in areas where the flood has not occurred yet, people are already planning to make adaptations. Measures they take, are elevating the house and raising the floor level (Harwitasari & Van Ast). Furthermore, it is important to note that the flood, beside the impact of the flood on daily activities of inhabitants, raises the risk to be exposed to diseases and other infections, which has mainly an impact on children (Soedarsono in Marfai et al., 2008).

Villages Adaptation mechanism	Bandarharjo & Tanjung Mas	Terboyo Wetan & Trimulyo	Tawangsari, Terboyo Kulon & Tanjung Mas
Raising garden level	87	29	13
Elevating the house	75	32	21
Raising floor level	64	24	21
Making a small dam	60	17	8

Table 4.3 – adaptation methods (in percentage) in coastal villages

Summarizing

All in all, several points can be summarized from the above. In short, there can be said that people in different villages in the coastal area, namely Bandarharjo, Tanjung Mas, Terboyo Wetan, Trimulyo, Tawangsari**,** Terboyo Kulon, Kemijen, Tambakrego, Mlatibaru, Mlatiharjo and Kaligawe, all experience an ongoing threat of the tidal flooding. Even though they experience this threat, they stay in the area. This is mostly because of the lack of capital. After this, the accessibility to the city centre, public services, their ancestral house, their property and their jobs are important. The cultural value is a last motivation for people to stay in the area.

The social contacts people have in their neighborhood is also a reason for some people to stay here (M. A. Marfai, personal communication, 23 April 2012; Dewi, 2007). People living here have a lot of social interactions with their family and their friends. Only people with money and relative little social interaction in the area would move away due to the land subsidence or the floods. People with capital and relatives and friends in the area prefer to enhance their houses, this can be by enhancing the floor level, making second storey's, making small dams or enhancing the garden. Moreover, the social network is often used to reduce the negative effects of the flood (Dewi, 2007). Through the subjective norm and the attitude is the decision to perform behavior influenced. The subjective norm is present here through the importance of the social environment which makes people stay in the area; moreover, it is possible that people do not feel a negative pressure to stay here but the social contacts makes the area valuable. The attitude is an essential factor here through the consideration people make, namely moving away from the flood and away from family and friends or staying and coping with the floods and having family and friends nearby.

People in Terboyo Wetan and Trimulyo perceived the flood depth as greater and the duration longer than people in Bandarharjo and Tanjung Mas. Even though while the latter is

coping with more tidal inundation and land subsidence, since the latter are part of the six villages mentioned before. Beside this, the villages Kemijen, Tambakrego, Mlatibaru, Mlatiharjo and Kaligawe experience a deep flood depth (50-100 cm) with a long duration (3-7 days), while these villages are further inland than the other villages. It is difficult to find an explanation for this. If these villages lie in a valley it could be an explanation, but this is not the case. Another explanation could be because these villages are located at a riverside and the total flood perception is investigated, namely the river and the tidal flood perception. While the other researchers only studied the tidal flood and the river flood was not included.

Furthermore, the adaptation methods can also be related to the flood depth and the flood duration. People living in Bandarharjo and Tanjung Mas have made the most adaptation to their houses and their gardens, while they perceived flood depth is relative low compared to Terboyo Wetan and Trimulyo. Even though the flood depth is higher in the latter villages, they have less adaptation methods. An explanation of these fewer adaptation methods in Terboyo Wetan and Trimulyo might be the lack of capital. Though when looked at the lack of capital, more people in Bandarharjo and Tanjung Mas (65%) experience to have less capital then the people in Terboyo Wetan and Trimulyo (55%), so this cannot be an explanation. Marfai and Hizbaron (2011), the researchers who investigated Terboyo Wetan and Trimulyo, mentions the tendency of the community to neglect the risk of the hazard, they do not see it as a threat towards their safety. Therefore, this is the most plausible reasons for the lack of adaptation methods in Terboyo Wetan and Trimulyo while there is a great risk for flooding here.

4.2 Government

In this paragraph the policy, the measures and the projects of the government which focus on reducing the coastal floods and the flood risk are mentioned. Also the policy and project implementation are mentioned. This implementation can be hard due to capital shortages and corruption of the government.

As was mentioned in the introduction of this thesis, the government of Semarang has taken non-structural and structural measures. The focus of the first lies on social measures, namely public education and organizing disaster management and coastal planning (Marfai & King, 2008a). The national government should focus on making one approach for disaster management and improving the coordination between the different actors. This management has to take uncertainty, ambiguity and vagueness into account, whereby the best alternative will be chosen (Doornkamp, 1998). It is important that the government works together to formulate the best disaster management possible, because in the end the government has to action so they can cope with the rising flood risk. The government is working hard to integrate the different ministries into

working together so a more integrated flood policy can be designed (M. A. Marfai, personal communication, 23 April 2012).

The structural measures focus on infrastructural measures such as improving the dykes, the drainage system, the pump station, elevating the street level and reshaping the land surface. Improving the drainage system is made possible by removing sedimentation from the rivers and channels and improving the waste disposal system (Marfai & King, 2008a). This latter is

mentioned as a measure since people throw their waste into the river and channel, which contributes to the floods in the area (figure 4.3). An improved waste disposal system should stop the flood and seawater infiltration. There are also some disadvantages of this measure: houses and businesses have to be replaced, the water flow will be stopped and it will destabilize the environment.

Figure 4.3 – Waste in the river

Another structural measure of the government is the Banger Polder Pilot Project. This project is a cooperation between the Dutch government, the '*Hoogheemraadschap van Schieland en Krimpenerwaard*', Witteveen and Bos and the Indonesian government and the municipality of Semarang. This project focuses on reducing the daily floods in the urban low-lying deltas of Semarang by designing and developing a polder. The polder and the pumping station should keep the Banger-district dry. It is important that the management and the maintenance of the polder are organized well since this is normally not the case in Indonesia (J. Helmer, personal communication, 1 June 2012). If the polder and the pumping station are maintained well, then the usage will be much longer then if this is not the case. In Indonesia, and in other Asian countries, people normally do not repair or maintain products. In the project one of the focus points lies on the maintenance of the polder and pumping station. It is also important to note that for the management of the polder a water board is established (Helmer, n.d.). The water board is a cooperation of inhabitants, companies, universities and civil servants, since the inhabitants of the Banger-district did not want to pay the government taxes for the polder because of the corruption. In this cooperation the different parties know where the expenses go to and it can be clarified by each of them. For the water board, it is not only the government who has the responsibility. The corruption will be clarified in the next chapter.

Beside the non-structural and structural measures there are other measures. One of them is a groundwater tax-system. Through this tax-system the government of Semarang is trying to influence the groundwater withdrawal (W. Hadipuro, personal communication, 19 April 2012).

Owners of deep or artesian wells should measure the groundwater extraction. If this extraction exceeds a certain limit then they have to pay environmental tax. The more water is extracted, the more taxes have to be paid. Also the number of dug wells influences the amount of taxes to be paid. The government wants to use this tax to recover the bad impact of the groundwater withdrawal, like land subsidence (though this is not recoverable) or making more surface water available.

Furthermore, there are more projects that should reduce the coastal flood and improve the flood management in Semarang then are explained here. Marfai and King (2008a) mention twenty proposed projects, including the mapping of the coastal flood hazard, stakeholder involvement and strengthening the resilience of the inhabitants of flood prone areas. Several other projects focus on collecting data of hazards, shoreline change and risk assessment. Nicholls and Mimura (1998) mention this lack of sufficient data about land subsidence, groundwater withdrawal and flood. This observation was done on global level but can be applied on Semarang, Indonesia. Herefore they used the report of the IPCC about global climate change and the challenge of the rising sea level (IPCC, in Nicholls & Mimura, 1998). They stated that the adaptations and measures proposed by the IPCC showed the shortcoming in regional regions to implement these measures since there is in these areas incomplete knowledge, insufficient data, lack of methodologies and difficulties in developing future scenarios. Moreover, due to the fact that Semarang is already coping with a water problem, it has other priorities than doing research to the effects of climate change (J. Helmer, personal communication, 1 June 2012). This problem has to be solved first before there can be thought of other problems.

These parameters correspondent with what is mentioned in paragraph 2.3. Here is described that the flood policy mostly focuses on technical measures instead of taking environmental and socio-economic changes into account. But before the latter can be included in the flood policy, there has to be data about these developments. So the shortcomings of the flood policy can be linked to the lack of data.

Implementation policy

As above has been shown, there are examples where the designing of the policy or the projects is done well. Before it is possible to know if the policy is executed right, it has to be implemented. There can be a discrepancy between the development of the policy and the implementation of the policy. So it is not always without difficulties to implement the policy or the project. There can be several reasons for the lack of policy implementation of the government. This can be due to the lack of capital or due to the corruption in the city (M. A. Marfai, personal communication, 23 April 2012).

Beside implementing the policy, it is for policy designers also interesting to know whether the measures are noticed by inhabitants of the coastal area or not. An example of this are the inhabitants of the people in Tawangsari, Terboyo Kulon and Tanjung Mas. Most of the people living here are aware that the government elevates the street level (35%) (Harwitasari & Van Ast, 2011). In total, 50% of the people are aware that the government takes one measure. Beside taking one measure, it is also possible that two or three measures are taken but this is less noticed by the people, respectively 15% and 9% of the people are aware of this. There are also people who think that the government does not take measures at all, 27% of the people have this opinion.

As was mentioned in paragraph 2.2, corruption is a big problem in Indonesia and also in Semarang. The experienced corruption is shown by the content analysis of the interviews conducted with several people. Different projects of the government suffer from this. For example the groundwater tax-system, this system is in reality not actually working. Industries have much more groundwater wells then they pay for whereby they extract more groundwater then is allowed (W. Hadipuro, personal communication, 19 April 2012). The civil servants, who should check the measurement systems and the amount of wells registered, are bribed by the industries they should check. Not only is the tax-system coping with implementation problems, also the Banger polder pilot project is having difficulties. There are social problems in the area and the government is not cooperating (R. Susilorini, personal communication, 12 May 2012). Moreover, the implementation of this project is going slow due to problems with the organization and the implementation. For example, the well that was built collapsed due to a construction fault whereby it has to be rebuild. Furthermore, the new major is in jail because he is suspected of corruption and bribing members of the parliament (J. Helmer, personal communication, 1 June 2012).

This corruption is a common knowledge in Semarang. This also appeared to be a problem when the tax system for the Banger Polder Pilot Project had to be developed. Here, the inhabitants did not want to pay the government for the polder and the pumping system (J. Helmer, personal communication, 1 June 2012). They do not trust the government with their money since there is so much corruption. The newly developed water board gives the inhabitants trust, since different parties can clarify the expenses of this board.

Summarizing

There are several measures done by the government, structural and non-structural measures. Whereby the structural measures mostly focus on infrastructural adaptations such as improving

the dykes, the drainage system, the pump station and increasing the street level. The non-structural measures mostly focus on the social environment, whereby people in the coastal area get knowledge about coping with the flood and organizing disaster management and coastal planning.

The implementation of the policy of the government needs civil servants and capital. These both needs are the source for problems. First, there is a lack of capital, whereby not all the policy designed by the government can be implemented. Beside this, the corruption is a big problem in Semarang. Less than halve of the amount of money intended for a project or for implementing the policy is eventually used for the implementation. Both of these problems are important factors that should be taken into account when designing the policy since it influences the success of the implementation.

Furthermore, the policy of the government mostly focuses on technical measures. The environmental and socio-economic developments are not included, while these developments are important to be taken into account. Though, before these developments can be included in the policy, there has to be data. Till this moment, the government has a lack of up-to-date data of the developments that are taking place.

5. Analysis

As was described in chapter 2, the behavior of the people living in the coastal area can be linked to the policy of Semarang. Nevertheless, previous chapter describes the results mostly independently from each other. In this chapter the results are related to each other and to the theory of planned behavior (TPB) and the policy process. Furthermore, the two theories are also compared to each other which is graphically shown. This graphical model is compared to the conceptual model that was viewed in paragraph 2.4. Finally, a flood risk model is designed whereby the most important aspects of the flood risk are shown, namely the causes and consequences. Moreover, the interrelation of the flood risk with the two theories is shown.

5.1 Behavior and policy according to the theory of planned behavior and the policy process

In this paragraph are the results that were described and discussed in chapter 4 further explained. The results are explained according to the theory of planned behavior (TPB) and the policy process. This shows us that the results are related to each other. The focus of the policy process lies here on the agenda development, the policy design and the implementation of the policy.

Behavior

People living in the coastal area mostly stay here; only few of them have the intention to move away. Their stay in the area is mostly due to lack of alternatives since people have no or very few capital. Their motivation to stay is followed by the accessibility to the city centre, public services, their ancestral house or property and their jobs. Furthermore, the social contacts in the area are also important (M. A. Marfai, personal communication, 23 April 2012; Dewi, 2007). The social network of people is used to reduce the negative effects of the flood; examples of this are patrolling in the neighborhood, helping other community members in doing work and cleaning the area after a flood. Furthermore, the social relations in the area make people stay in their neighborhood and adapt their houses instead of moving away. Adaptation methods people make to their house are mostly raising the garden level, elevating the house, raising the floor level and making a small dam. This way they try to protect themselves against the flood. Beside these adaptations people make to their direct environment, people also make adaptations in their neighborhood to protect themselves indirectly. These adaptations can be increasing the street level, improving the drainage system and building dykes.

These adaptation methods makes it clear that all three factors of the TPB play a role in the decision making process of performing behavior. In the current situation the three factors motivate the stay of people in the area. The attitude shows that people weigh the positive and negative consequences of moving away against each other. Either there is a good accessibility to

the city centre public services and their jobs or people are protected from flood and the rising flood risk. Also the subjective norm makes people stay in the area. The social environment is important and makes their current living area attractive to live here. Relations within a family, between families and between friends are essential and make it hard to move away. It may also be that people feel pressured to stay in the area; this can be a positive as well as a negative pressure. Finally, the perceived behavioral control shows that people cannot perform the behavior they want to perform due to the lack of opportunities or resources, while the intention of people might be present. For example, if people want to move away from the flood, they have to have capital. If this is not the case they have to stay here. Thereby they decide to adapt their houses so their houses are more resistant to the flood. The perceived behavioral control is also present if people are obstructed in their daily activities due to the flood. Hereby, people cannot perform behavior due to conditions they cannot influence.

It was already discussed that corruption is a big problem in Semarang. Corruption also plays an important role in the policy process and the behavior of people. The different factors of the TPB return in this problem. First the attitude; people make a consideration when they weigh the positive and negative consequences of (possible) behavior. Straight forward said: civil servants in Semarang make this consideration when they take bribes and become corrupt. They make a consideration of doing the right or wrong thing; having money or doing the job right. Corrupt civil servants choose for money. In reality it is probably not that black and white and more grey. For example, an argument for taking bribes is the poverty people live in. Often people are paid below the minimum pay and they have two or three jobs to make money. Though if civil servants get caught for corruption it has a lot of consequences, they lose everything; their job, their pension and social security (J. Helmer, personal communication, 1 June 2012). Also, the government broadcasts the verdict on television. This will have face-loss as a consequence. Because of this, the subjective norm can also play an important role. The social pressure may prevent people from taking bribes. Furthermore, through the corruption it is hard to implement the policy since only part of the money is used for the policy or the project that was intended. So the perceived behavioral control is also a factor which is influenced, since this determines whether behavior can be controlled or implemented. Thus the corruption that takes place in Semarang can be analyzed by the three predictive factors of the TPB.

In short, the behavior of people living in the coastal area can be analyzed with the TPB. The three predictive factors and the intention to perform behavior can all be found here. The attitude, the subjective norm and the perceived behavior control can explain people's reasons for staying in the flood risk area and the corruption that takes places in Semarang. This analyze shows that

the adaptation methods of inhabitants and the corruption in society are not independent phenomena. Different factors are involved before a person makes a decision whether or not to perform certain behavior.

Policy process

As was discussed before, the government of Semarang has taken several measures to cope with the land subsidence and the floods, as well as structural as non-structural measures. It is these measures and the projects designed by the government are implemented right. The Banger Polder Pilot Project and the groundwater tax-system are projects that are analyzed, taken into account the policy process.

The Banger Polder Pilot Project is a cooperation between Dutch companies and the Indonesian government whereby they designed it together. Although the project is still under construction, it is important to note that the project should be correctly implemented. If it is implemented correct then the people living here should be protected from the flood and is it possible to see if the policy design was right. Furthermore, during the implementation of the civil servants encountered several problems, such as the collapse of the well and the distrust of the inhabitants. For this latter a water board is established; this board is a cooperation between inhabitants, companies, universities and civil servants. This cooperation should withstand the corruption that is present in society. If this water board works, people see another side of the government, a side that they can trust with their money due to the taxes they have to pay for the polder. This trust may stimulate such a water board for other projects whereby drainage systems are better maintained; a positive reaction to a certain project can stimulate another project. Therefore, the agenda development can indirectly be influenced through the success of this project. Thus, this example makes it clear that the policy design, the policy implementation and the agenda development of the policy process can all be found in practice.

The groundwater tax-system is an example of a policy of the government that is not implemented right. The policy design was clear, namely asking environmental tax over the amount groundwater that is extracted and the number of dug wells. If either of these, or both, exceeds, more taxes have to be paid. However, through the corruption among civil servants industries pay less tax than they should pay with their amount of wells and their groundwater withdrawal. Thus, the policy is not implemented right; this examples also shows that civil servants take the positive and negative consequences of their behavior into account and they accept these consequences when they take bribes, which is in this case, not collecting the taxes.

Furthermore, the government has a lack of sufficient data. Therefore it can be difficult to design the policy since there is not enough knowledge about certain developments in society.

Data about land subsidence, groundwater withdrawal, flood and hazards are needed. By combining the current flood policy, this data and the environmental and socio-economic developments, a more holistic and integrated flood policy can be designed. Moreover, it is important that the different ministries of the government cooperate with each other. A better cooperation between the ministries should improve the designed flood policy. Thus, the lack of data and the lack of cooperation obstructs the process of designing the policy.

In short, the measures and projects formulated by the government can be analyzed taking into account the policy process. This analyze shows that the policy design and the policy implementation can almost always be found and used to explain the policy; the agenda development is less present in these analyzes. This may be because of the fact that it is a 'western' theory, based on the western society whereby it might be the case that it is not present in Indonesian society at all. Furthermore, the analyzed showed that not all the measures and projects designed by the government are implemented right. This can be due to the corruption but also due to the fact that there is a lack of sufficient data. Sufficient data about future developments could change the policy designed by the government; it will be a more comprehensive policy.

5.2 Theory of planned behavior and the policy process
In this paragraph are the TPB and the policy process related to each other. This is supported by the results that were discussed before. The theories are related to each other based on the assumptions made in paragraph 2.4; from these assumptions relations are added and removed. Finally, the relations that are found are shown in a new model. This new model is compared to the conceptual model viewed in paragraph 2.4.

There are several relations between the TPB and the policy process; these links are illustrated and supported by the results that were found. The first links between the theories can be illustrated with the unsuccessful groundwater tax-system of the government and the corruption that takes place in Semarang. There is a relation between the attitude of people and the implementation of the policy. Civil servants that should implement the policy are taking bribes instead of realizing the policy. Therefore the policy is not implemented right. Here, civil servants take the positive and negative consequences of taking bribes into considerations before they make the decision to decline or accept the bribes. If civil servants support the policy it is more likely they implement it right, this way the implementation influences the attitude.

Furthermore, there is a relation between the subjective norm and the implementation of the government. Social contacts and the social environment are very important in the Indonesian society, in case of the flooding, people help each other with the negative effects. Thus, face-loss is

one of the worst things that could happen to an Indonesian. Therefore, the social pressure most probably influences the decision making process of people before they take bribes. This way, the subjective norm influences implementation and is influenced by implementation, since people feel the social pressure to implement the policy.

The perceived behavioral control has a direct link with the implementation of the policy because instruments and capital are needed for this. However, through the corruption, only part of the intended money is used for the implementation of the policy or projects. Moreover, the government is already coping with money problems. Thus, without instruments and capital the policy cannot be implemented. This way the policy and the projects designed by the government are influenced since there is no possibility to implement the policy. Furthermore, the perceived behavioral control can also be influenced through the implementation of the policy. The instruments used for the implementation of the policy can be part of the needed resources and the opportunities of the perceived behavioral control of people. This can be illustrated by the Banger Polder Pilot Project. This project focuses on challenging the flood with a pumping station and deepen the channel. Hereby, people who are currently living in a flood risk area will be protected and safe from the flood. Furthermore, if this area is safe from the flooding, people have more freedom, as well physically as financially, since they do not have to make anymore adaptations to their house. So, it is possible that the opportunities and resources of people increase through this project.

There is also a link between the perceived behavioral control and the policy design; the perceived behavioral control influences the policy design. The lack of sufficient data present at the government illustrates this. The government should have more data about land subsidence, groundwater withdrawal, flood and hazards. Through this lack the government does not have the opportunity and the amount of resources that is needed for formulating a good policy. Moreover, through this lack of data it is also hard to develop future (climate change) scenarios. Though these scenarios are necessary to develop, since Semarang cannot avoid the climate change.

Furthermore, the policy design can influence the attitude of the behavior of people. For example the water board that is developed for the Banger Polder Pilot Project is established with different actors, including citizens. Therefore, all the actors can be informed about the expenses of the board. This should stimulate the transparency of the government. This makes it possible for people to be more positive about and have more confidence in the government. The attitude can also influence the policy design. People make a consideration of the positive and negative consequences of their behavior. This consideration contributes to their decision to make adaptations in their neighborhood to protect themselves from the flood. These adaptations

influence the policy design of the government since the government is also taking measures. If these measures are done by citizens, the government can take over these measures or the government is free from taking these measures.

Moreover, the subjective norm can also influence the policy design. Just as mentioned before, this relation can be illustrated with the water board of the Banger Polder Pilot Project. Inhabitants of this area refused to pay the government taxes for the polder due to the corruption. They kept this point of view, whereby the major eventually submitted and established the water board. This shows that the social norm played an important role in the policy design.

All in all, in the case of Semarang the Theory of Planned Behavior and the policy process are related to each other. These relation can also be summarized in a graphical view (figure 5.1). The different factors of the theories that are related to each other are shown here; these relations are based on the results collected from interviews and secondary data.
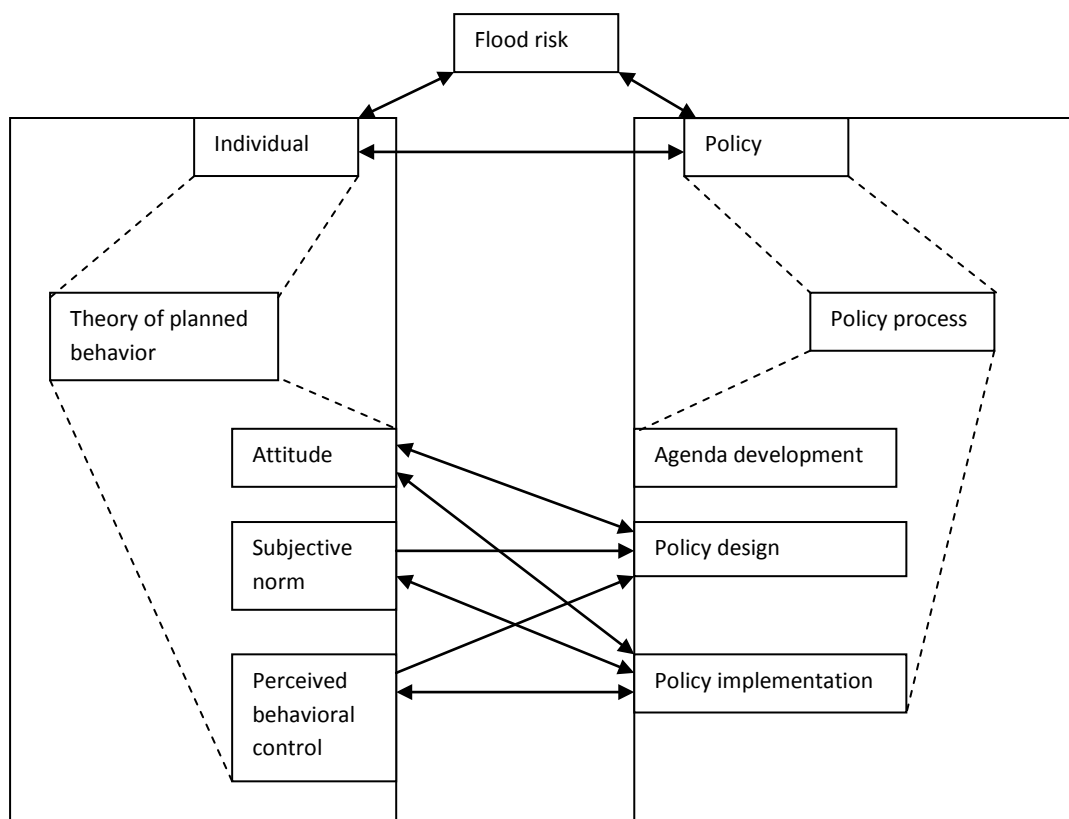

Figure 5.1 – The relations between the TPB and the policy process

This model (figure 5.1) can be compared to the original conceptual model (figure 2.4). These two models differ from each other due to the fact that the relations in the original model are based on the literature of the theories and common sense reasoning while the relations in the new model

are based on the data from interviews, secondary data and the literature study. Therefore, there are several relations that differ between the two models. If a relation from the old model between two factors is not supported by the results in the new model, it does not mean that this relation does not exists, it only means that this relation is not present in Semarang.

The original model shows a link between the subjective norm and the agenda development. This relation did not appear in the results. Therefore this relation is excluded in the new model. Through this exclusion there is no relation between the agenda development and any of the predictive factors of the TPB. This is due to the fact that there was no data found about the agenda development of the flood policy of the government, whereby this relation cannot be supported by the results. This can possible be explained due to the differences in society. The policy process is a 'western' theory designed for 'western' society, whereby 'western' traditions, norms and values are taken into account. This society differs from the Indonesian society. For example, the 'western society' focuses on ones performances, the achieved results are imported here; while in the Indonesia society the focus lies on the relation people have with each other and their families, the social relations are much more important here (J. Helmer, personal communication, 1 June 2012). This differences in culture might be the reasons why the agenda development has not showed any results with the TPB.

In the original model there was a mutual influence between the subjective norm and the policy design. This relation was based on the idea that if people support certain policy of the government then they would stimulate this policy in their close environment, hereby the policy design and the subjective norm would influence each other. Though, this relation is not supported by the results. However, in the new model the subjective norm influences the policy design. The pressure from society made eventually the major to give . Whereby the policy design, or in this case project design, is influenced by the subjective norm.

The relation between the perceived behavioral control and the policy design differs between the two models. According to the old model the policy design influences the perceived behavioral control while in the new model the perceived behavioral control influences the policy design. The relation is the old model is based on stimulating certain behavior through allowances or comparative tax benefits. The results did not show any behavior stimulating measures. Therefore, this relation cannot be supported by the results. The relation in the new model is based on the influence of the lack of sufficient data (resources of the perceived behavioral control) on the policy design. Through the lack of data it is hard to design a policy that is based on facts though this is important for good policy.

Finally, there are a four relations that do not differ between the two models, namely the relation between attitude and policy design, the attitude and the implementation, the subjective

norm and the implementation and the perceived behavioral control and the implementation. These factors of the two theories influence each other and are supported by the results.

5.3 Flood risk model

In the above paragraph is the relation between the two theories elaborated, which is in the end illustrated in a graphical view. This model does not view certain developments in society, namely the empirical developments that take place. In this paragraph, the theoretical and empirical relations are further explained, whereby a model is made to show the relation between the core topics of this research.

As was shown in figure 5.1, flood risk influences the (behavior of the) individual and the policy. Though, the causes of the flood risk are not mentioned here since it is not based on one of theories. However, these causes still influence the behavior of the individual and the policy of the government indirectly, so it is important that they are still mentioned. The flood risk is influenced by the sea level rise and the land subsidence, whereby the latter is caused by construction load, natural or man-made collapse and groundwater withdrawal. These developments can also be placed into a vicious circle; people extract the groundwater for domestic and industrial use, whereby the land subside, this land subsidence causes a higher flood risk which makes people in the coastal area adapt their houses. All this time, the groundwater is being extracted because people do not have other opportunities to get drink water, whereby the land subsidence continues.

Furthermore, the social contacts are important in the Indonesian society. The relations people have with their family and friends are essential for them and make it hard to move away. Therefore, a lot of people stay in the flood risk area, combined with the fact that they have no capital to move away. If they have capital, they use it in for house adaptations.

Moreover, the corruption is that is present in Semarang is a significant restrictive factor. The corruption makes it hard to implement policy, projects and measures taken by the government since only part of the intended amount of money is eventually used for this. Furthermore, the government is taking little action to challenge the corruption with policy, so the corruption remains.

The relations between theoretical and empirical factors are explained in the above. A holistic model of the flood risk (figure 5.2) shows these relations graphically.
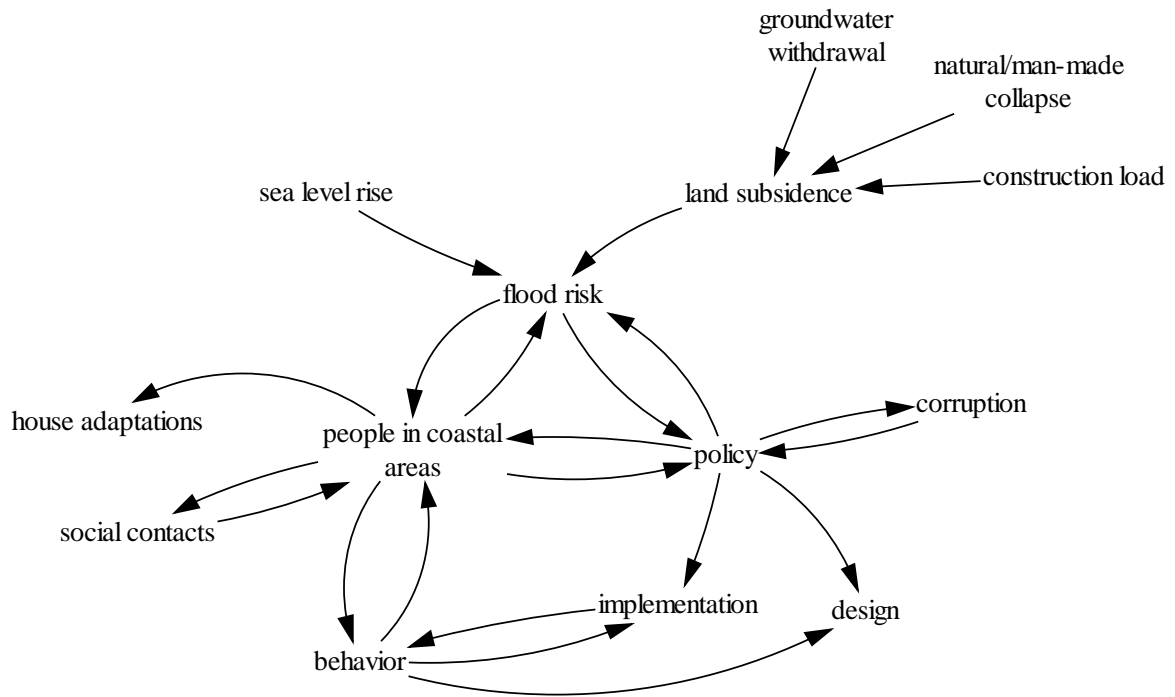

Figure 5.2 – Holistic model of the flood risk in Semarang

This model (figure 5.2) is based on the data collected from the interviews with experts and secondary data. It illustrates the most important aspects of the flood risk in Semarang. The causes of the increased flood risk are shown, just as the impact of the increased flood risk on people in the coastal area and the policy. Furthermore, the most important interrelations between the two theories are graphically shown, namely the influence of the behavior of the individual on the policy design and the mutual influence between the implementation of policy and the behavior of people.

6. Conclusion and reflection

In this chapter, the results from previous chapters form the basis of the conclusion. The coping strategies against the flood of inhabitants of the coastal area and of the government are shortly described. They are compared to each other so the possible discrepancy emerges. By connecting the results to each other, the research question is answered. In the end there is a reflection of this research. Several important issues that were encountered while writing this thesis are discussed and some recommendations for further research are done.

6.1 Conclusion

In this paragraph the research question is answered. Before this is possible the behavior of people in the coastal area and the policy of the government are described and compared to each other. This makes it possible to finally conclude if there is a discrepancy between these subjects. In the end the research question is answered.

As was described in previous chapters, inhabitants of flood prone areas have several coping strategies for the floods. These coping strategies mostly focus on adaptation measures before the flood, only few of them are taken during or after the flood. People mostly elevate their house or their garden, make a dam to prevent the water for coming inside their house or raise the floor level. In short, these measures focus on safeguarding the property. Also people in flood free areas are planning to make adaptations as elevating the house and raising the floor level. Measures taken during the flood focus on preventing the water from entering the house by closing the door and windows and evacuating people and belongings. After the flood has taken place, people clean or repair the house and the surroundings so the remains of the flood are removed. Beside adaptations made to the house, most people also contribute to the neighborhood protection. This way people are also indirectly protected from the flood. Measures in the neighborhood are mostly elevating the street level and improving the drainage system.

These measures taken by inhabitants of flood prone areas can be clarified with the theory of planned behavior. Due to the fact that most people do not have enough capital to move away they adapt their house so they are protected from the flood (perceived behavioral control). Moreover, the social environment in the neighborhood is also important. The social network is often used to help with the aftermath of the flood. Beside this, family and friends live in the same neighborhood which can be a reason for their stay (subjective norm). Furthermore, people are still able to cope with the flooding whereby they accept it. Due to this acceptance, they have advantages as accessibility of the city centre, public services, their ancestral house, their property and a short home-work distance (attitude).

The government has taken several measures to cope with the flooding in the area. These measures focus on the infrastructure and on the social environment. By improving dykes, the drainage system, the pump station and elevating the street level they want to lessen the flood in the area. Measures in the social environment should enhance people's knowledge about the flood and the flood protection through education. Also developing one disaster management would contribute since this way people know the measures they have to take in case of a flood or hazard.

The policy that is developed by the government is based on data that is incomplete due to the fact that there is lack of sufficient data, therefore it hard to formulate policy. Data is needed about groundwater withdrawal, flood, sea level rise and hazards. This data, combined with the current policy, environmental and socio-economic developments, climate change scenarios and cooperation between the different ministries a more holistic and integrated flood policy can be designed.

Furthermore, the implementation of the policy is hard due to corruption and lack of capital. The corruption is linked to the behavior of people and therefore also the theory of planned behavior. People make a consideration of the positive and negative consequences of their behavior, which is in this case taking bribes or initiating bribery (attitude). Hereby these people most likely take the opinion of other people into account before they make the decision (subjective norm). In addition to this, the very low minimum wage makes it very appealing to take the bribes so life will be more pleasant (perceived behavior control).

The policy of the government and the behavior of people are interrelated, which is supported by the data. The attitude, the subjective norm (social pressure) and the perceived behavioral control (opportunities and resources) present with individuals influences and are influenced by the implementation of the policy. Moreover, the attitude, the subjective norm and the perceived behavioral control also influence the policy design, whereby the policy design influences the attitude too. This interrelation was illustrated through the corruption, the groundwater tax-system and the Banger Polder Pilot Project.

Beside this interrelation of the behavior and the policy, there is also a discrepancy between the coping strategies of inhabitants of the flood prone areas and the measures done by the government. This is mostly present in the different measures and adaptations they both take. The government has to protect all its inhabitants, while the inhabitants only have to protect themselves and their family. The inhabitants try to protect themselves by making direct and indirect adaptations.

Furthermore, the measures of the government and the inhabitants also differ from each other when looked at the amount of capital. Inhabitants have less capital than the government; therefore it should be possible for the government to make more measures. However, the government has a lack of capital, whereby policy and projects cannot be implemented.

The government is coping with the flood by making infrastructural and social measures. They take the same infrastructural measures as inhabitants make in their neighborhood. These measures have to be implemented by civil servants who are, to a large extent, corrupt. Hereby, the implementation of the government is harder and more difficult than without corrupt civil servants. Moreover, hereby the implementation of the policy can be slower done than the measures done by inhabitants. Furthermore, measures by the government also focus on improving the dykes and the pump station. This is more focused on keeping the water from the area, which is something only the government can do.

In short, the government has to protect its citizens from the flood, whereby the inhabitants of the coastal area only have to protect themselves and their family. Furthermore, the government tries to keep the water from the area while inhabitants take measures whereby they try to cope with the flood. These people are still coping with the flood, they are not moving away. The government anticipated on this by developing the Banger Polder Pilot Project. Hereby are the people living in this flood risk area protected from the flood.

A solution might be the cooperation between inhabitants of the coastal area and the government. The inhabitants are already making adaptations to the area without the support of the government. If the government supports these measures then it is possible to make more adaptations. This support might raise the trust in the government since people do not trust the government due to the large amount of corruption that is present in Semarang.

Beside a cooperation between inhabitants and the government, it is important that a reliable data system will be developed. This data system makes it possible to know the actual amount of groundwater withdrawal, flood, sea level rise and hazards. Herefore, future climate change scenarios can be developed and policy can be adapted to this. It is important to note that the implementation of the policy is influenced through the attitude, subjective norm and the perceived behavioral control of people. These factors should be taken into account when the policy is designed, whereby more effective policy measures can be taken.

Thus, my research question: *In which way do the people and the government cope with higher flood risk in Semarang, due to land subsidence and the rising sea level, and is there a discrepancy between this policy and the behavior of the people of Semarang?* is answered.

6.2 Reflection

During the process of gathering information for and the writing of this thesis, several issues occurred. These issues are described here, just as some recommendations are made for further research.

This research only focused on the perception on inhabitants, on their perception of the flood, the flood duration and the flood depth. These perceptions, and therefore the experiences of people, are linked to the adaptation methods of inhabitants; the conclusion about the behavior of people is based on this. So the perception of people has relatively a large influence on the outcome of this research. This research will be more valid and reliable if the actual data about land subsidence, flood and sea level are added. These different data can be combined and compared to each other. This way a more holistic point of view can be developed and the conclusion that is made, is based on more data, whereby it is more solid and reliable. This might be interesting for further research.

Furthermore, this research is based on secondary data and interviews conducted through e-mail correspondence, Skype and face-to-face conversations. A lot of data is gathered through this; different opinions of experts are taken into account. An observation in the research area and talking to people who actually live in the flood risk areas, would make this research better, only this was not possible in the amount of time given.

Finally, it is important to note the following. As was already mentioned in the results, the tax- and measure system that is developed for the groundwater withdrawal and the wells is not working. A lot of industries have more wells than are registered, through the corruption these industries are not fined. In the end, there is a big chance that the official groundwater extraction-facts are incorrect since they are based on the registered wells of the industries. Which means that these numbers are in reality much higher. Therefore the numbers mentioned in the chapter 2 about the groundwater withdrawal can be incorrect because these are based on scientific articles and official governmental numbers.

References

Abidin, H. Z. et al. (2010). *Studying land subsidence in Semarang (Indonesia) using geodetic methods*. Founded at 8 May 2012, at http://www.fig.net/pub/fig2010/papers/fs04d/fs04d_abidin_andreas_et_al_3748.pdf

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes, 50*, 179-211.

Akkerman, A., & Vries, M.S. de. (2008). Problemen op de agenda. In A. Hoogerwerf & M. Herweijer (Red.), *Overheidsbeleid. Een inleiding in de beleidswetenschappen* (pp. 63-82). Alphen aan den Rijn: Kluwer.

Bamberg, S., Hunecke, M., & Blöbaum, A. (2007). Social context, personal norms and the use of public transportation: two field studies. *Journal of environmental psychology, 27*, 190-203.

Baxter, J. (2009). Content analysis. *International encyclopedia of human geography*, 275-280. University of western Ontario.

Bressers, J. T. A. (2008). Evaluatie van beleid. In A. Hoogerwerf & M. Herweijer (Red.), *Overheidsbeleid. Een inleiding in de beleidswetenschappen* (pp. 155-177). Alphen aan den Rijn: Kluwer.

Coolsma, J. C. (2008). De uitvoering van overheidsbeleid. In A. Hoogerwerf & M. Herweijer (Red.), *Overheidsbeleid. Een inleiding in de beleidswetenschappen* (pp. 119-136). Alphen aan den Rijn: Kluwer.

Dewi, A. (2007). *Community-based analysis of coping with urban flooding: a case study in Semarang, Indonesia.* Master's thesis. ITC, Enschede.

Doornkamp, J. C. (1998). Coastal flooding, global warming and environmental management. *Journal of environmental management, 52*, 372-333.

Druckman, D. (2005). Doing research. In *Content analysis* (pp. 257-275). Doi: 10.4135/9781412983969

Harwitasari, D., & Ast, J.A. Van. (2011). Climate change adaptation in practice: people's responses to tidal flooding in Semarang, Indonesia. *Journal of flood risk management*, 1-18. Doi: 10.1111/j.1753-318X.2011.01104.x

Helmer, J. (n.d.). It's all about vitamin R. *Logo south programma, water politics.* The Hague: VNG international.

Hoogerwerf, A. (2008). Beleid, processen en effecten. In A. Hoogerwerf & M. Herweijer (Red.), *Overheidsbeleid. Een inleiding in de beleidswetenschappen* (pp. 17-34). Alphen aan den Rijn: Kluwer.

Intergovernmental panel on climate change (IPCC). (2007). *Climate change 2007: synthesis report. Annex 1.* Founded at 23 April 2012, at http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_appendix.pdf

Longhurst, R. (2009). Interviews: In-depth, semi-structured. In *International Encyclopedia of Human Geography* (pp 580-584). Doi:10.1016/B978-008044910-4.00458-2

Marfai, M. A., & Hizbaron, D. R. (2011). Community's adaptive capacity due to coastal flooding in Semarang coastal city, Indonesia. *Seria Geografie, 2*, 209-2011.

Marfai, M. A., & King, L. (2007). Monitoring land subsidence in Semarang, Indonesia. *Environmental geology, 53*, 651-659.

Marfai, M. A., King, L. (2008a). Coastal flood management in Semarang, Indonesia. *Environmental geology, 55*, 1507-1518.

Marfai, M. A., & King, L. (2008b). Potential vulnerability implications of coastal inundation due to sea level rise for the coastal zone of Semarang city, Indonesia. *Environmental geology, 54*, 1235-1245.

Marfai, M. A., & King, L. (2008c). Tidal inundation mapping under enhanced land subsidence in Semarang, Central Java Indonesia. *Natural hazards, 44*, 93-109.

Marfai, M. A., King, L., Sartohadi, J., Sudrajat, S., Budiani, S. R., & Yulianto, F. (2008). The impact of tidal flooding on a coastal community in Semarang, Indonesia. *Environmentalist, 28*, 237-248.

Nicholls, R. J., & Mimura, N. (1998). Regional issues raised by sea-level rise and their policy implications. *Climate research, 11*, 5-18.

Peppel, R. A. van de. (2008). De naleving en handhaving van beleid. In A. Hoogerwerf & M. Herweijer (Red.), *Overheidsbeleid. Een inleiding in de beleidswetenschappen* (pp. 137-154).

Rahardjo, T. (2000). The Semarang environmental agenda: a stimulus to targeted capacity building among stakeholders. *Habitat international, 24*, 443-453.

Satterthwaite, D., Huq, S., Reid, H., Pelling, M., & Romero Lankao, P. (2007). *Adapting to climate change in urban areas: the possibilities and constraints in low- and middle income nations*. International institute for environment and development.

Sivakumar, M. V. K. (2005). Impacts of natural disasters in agriculture, rangeland and forestry: an overview. In M. V. K. Sivakumar, R. P. Motha, & H. P. Das (Eds), *Natural disasters and extreme events in agriculture, impacts and mitigation* (pp. 1-22). Berlin: Springer Verlag.

Smith, K., & Petley, D. N. (2009). Environmental hazards, assessing risk and reducing disaster. New York: Routledge.

Transparency international. (2011). *Corruption perception index 2011*. Founded at 4 June 2012, at http://cpi.transparency.org/cpi2011/results/

Ward, P. J., Marfai, M. A., Poerbandono, & Aldrian, E. (2012). Climate adaptation in the city of

    Jakarta. In J. Aerts, W. Botzen, M. J. Bowman, P. J. Ward, & P. Dircke (Red.), *Climate adaptation*

    and flood risk in coastal cities (pp. 285-304). Abingdon: Earth scan.

Appendix 1 – Interviews

The interviews for this research were conducted with Wijnato Hadipuro (Soegijapranata Catholic University), Muh Aris Marfai (Gadjah Mada University), Retno Susilorini (Civil Engineering department of Soegijapranata Catholic University) and Johan Helmer ('*Hoogheemraadschap van Schieland en de Krimpenerwaard*'). Many thanks for these people for letting me interview them.

Network of the interview with Hadipuro

Network of the interview with Marfai

Network of the interview with Susilorini

Network of the interview with Helmer