Korean tidal flats: unique places where nature meets economy

"A comparative study in the use, approach and management of tidal flats between the Netherlands and Korea."

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Master thesis Economic Geography
Faculty of Spatial Sciences
University of Groningen
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Seoul/Groningen, December, 2011

university of groningen

KOREA UNIVERSITY 1905

"You have a great treasure here. The tidal flats here show how river, field, sea and island ecology can be connected together. In addition, it is one of the most beautiful places on earth where tidal flats and human beings live harmoniously together. You are blessed to be here"

(Harald Marencic, Common Wadden Sea Secretariat, 2010)

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Acknowledgement

My name is Jasper Heslinga and I am a masterstudent in Economic Geography at the University of Groningen. In front of you is my masterthesis, which is the final product of an intense period of a semester abroad, lots of reading, data gathering and new experiences.

The starting point of this thesis is the tension field between economy and ecology, which I find very interesting and in ecosystems like tidal flats this tension field is especially very present. In the Netherlands we are quite proud of our Wadden sea, but I think hardly anyone knows about the tidal flats in Korea, who are just as unique as the Wadden sea.

This master thesis could not have been done without the help from a lot of people, which I would like to thank for their help, advice and understanding.
First, in particular I would like to thank prof. dr. Jouke van Dijk from the University of Groningen, who was my supervisor from the first idea until the final presentation. In the beginning of the master he told me there were tidal flats like the Wadden sea in Korea and that there is still little known about this area. During my semester in Korea we kept contact by email and back in the Netherlands we had some meetings where he gave me directions and advice.
Second, I would like to thank prof. dr. Jun Koo from Korea University who made it possible for me to actually come to Korea. He also helped me with my struggles of doing research abroad during our weekly meetings. I also would like to thank Injae and Jong Min (Korea University), who took care of me the first days in Seoul and helped me with some practical things which made my stay in Korea much easier.
This thesis could not be possible without the input of all the scientists, people from NGOs and government spokesmen, which I interviewed about the situation of the tidal flats in Korea and of course I would also like to thank all the respondents who were in my survey. Especially I would like to thank dr. Harald Marencic and mr. Jens Enemark from the Common Wadden sea secretariat (CWSS), who have a lot of knowledge of what is going on in Korea and who invited me to Wilhelmshaven to share some experiences.
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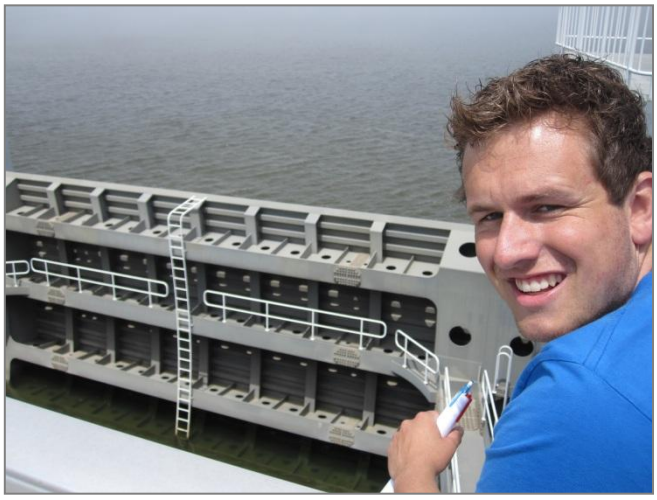
Jasper Heslinga
Groningen, December, 2011



Mun (2011)

Abstract

Tidal flats are important, but are also within a tension field between economy and nature. Korea and the Netherlands both have tidal flat areas which are unique in the world. In this research these areas will be compared with each other on their physical, economic, social and political aspects. By looking at their similarities and differences can be concluded what both countries can learn from each other, regarding the use, approach and management of their tidal flats.
In first appearance the tidal flats in Korea and the Netherland might look the same, but the tidal flats in Korea are spread along the Korean coast like a mosaic and they are more diverse in size and type. Both areas are rich in benthos and therefore resting and feeding grounds for migratory birds and this makes the tidal flats of great importance to the world.

The Wadden sea in the Netherlands is lying in an area that is quite under populated compared to the rest of the country. In Korea the tidal flats are also in an area where not many people live, except for the northwest part (Seoul & Incheon). In economic terms can said that the tidal flat areas in both countries are economically undeveloped compared to the rest of the country, but the northwest area of Korea is again an exception.
In the Korean tidal flat areas agriculture and fisheries are important economic sectors and in the northwest industry is the most important sector. Tourism in Korea is still in its infancy, while in the Netherlands this is one of the most important sectors. Agriculture, fisheries and industry are also important sectors in the Wadden sea area, but are declining.

Korea and the Netherlands both have a historical tradition in land reclamation. But in the Netherlands the environmental movements started to raise awareness for tidal flats since the 1970s, while in Korea this started in the early 1990s when important events occurred like the Rio Summit (the environmental summit by the UN in 1992) , Sihwa lake failure (a polluted land reclamation project in Korea) and the Saemangeum reclamation (a large scale land reclamation project in Korea). During the Saemangeum controversy about seventy percent of the population was against land reclamation of tidal flat, but nowadays Korea looks quite divided in their opinion about land reclamation and Saemangeum. Based on this research can also be said that gender and age aspects play a role in the opinion of the Korean people about tidal flats. The NGOs in Korea lack a strong organization, political influence and financial funding, while in the Netherlands NGOs are quite strong and influential.

In Korea the political structure is very complex, but in general it can be said that the Korean democracy is still quite young and therefore the system is more hierarchal than in the Netherlands. There is no integral management policy for the tidal flats in Korea, therefore different government departments on different levels do not cooperate with each other and can make different policies for the same areas. The Netherlands are trying to manage the Wadden sea area in an integrated way, but in practice it is quite difficult to achieve, because of the tangle of stakeholders with different interests. In Korea and the Netherlands there is a difference in the political culture. Where Korea has a hierarchic system, the Netherlands has a culture of debate and negotiate, called ‘polderen’.

In the Netherlands most of the environmental cases were decided in favour of the nature protection while in Korea that many laws governing conservation have not achieved balance, but have mainly favoured rapid economic growth. The Memorandum of Understanding that Korea signed with the Trilateral Cooperation (a cooperation between the three Wadden countries: Denmark, Germany and the Netherlands) is important for Korea to learn from the experiences of countries like the Netherlands in policy and management, monitoring and education about tidal flats. Korea is also enlisted to the Ramsar convention, which is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Being enlisted to the Ramsar convention can be useful for raising public awareness among the Korean people.

The lessons that Korea and the Netherlands can learn from each other are that Korea should get an integrated national policy for the tidal flats were different department and government level work together to get a better policy for the tidal flats. Also the NGOs in Korea have to become stronger (better organization, better funding, more political influence) and they need to convince the public with strong technical arguments. Public awareness in Korea can be raised by educating the people in schools, tidal flat centres or by eco-tourism. The Memorandum of Understanding can become very important for Korea to learn more about the lessons that were described above.
A lesson that the Netherlands can learn from Korea is that the Korean tidal flats are more heavily used in comparison to the Netherlands. Compared to the Netherland the tidal flats of Korea still have local importance for fishermen and this is also reflected in their culture by local traditions, fishing methods and food.

Keywords: nature, economy, tidal flats, wetlands, ecosystems, Wadden sea, Getbol, tidal flat management, Sihwa, Saemangeum, Ramsar convention, Common Wadden Sea Secretariat (CWWS)

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Chapter 1: Introduction

1.1 Introduction

In this first chapter, the motivation for this research will described. This will be followed by the definition of the problem, the objectives of this research and eventually the questions of this research. Also the research area will be defined briefly and the relevance of this research (social and scientific) will be explained. Finally, the bookmark will give an overview of the chapters that will follow after this chapter.

1.2 Motivation

Tidal flats are important! Tidal flats are in general coastal wetlands that have been formed because of sand and mud deposits from rivers and seas. Most of the time they can be found in bays, lagoons or estuaries. A lot of people might wonder what could be that special about tidal flat, but they are unique ecosystems, which provide good conditions for rare species to grow in and evolve. They are highly productive areas that support lots of animals (mostly birds) and Kim (2007) describes tidal flats as following:

"Tidal flats are treasure troves of our ecological system, a well spring of natural resources for the benefit of the environment and humankind." (Kim, 2007)

The greatest share of the tidal flats is located in remote places, but some tidal flats lie in highly populated areas. The fact that tidal flats are very shallow, makes them very suitable for land reclamation projects in order to strengthen economic growth in those highly populated areas. This might causes tensions between nature and economy and between preservation and development. In this research the tension between nature and economy will be the starting point of this research.
In the Netherlands there is a tidal flat called 'the Wadden sea' and it was enlisted as unique world heritage by UNESCO in 2009. But Kellerman & Koh (1999) claim that this tidal flat is not as unique in the world as people would think, namely along the west coast of Korea multiple tidal flat areas can be found. These two areas are one of the few tidal flat areas that are lying in highly populated countries. Therefore it is interesting to investigate both cases and make a comparison between the two countries in use, approach and management of the tidal flats.

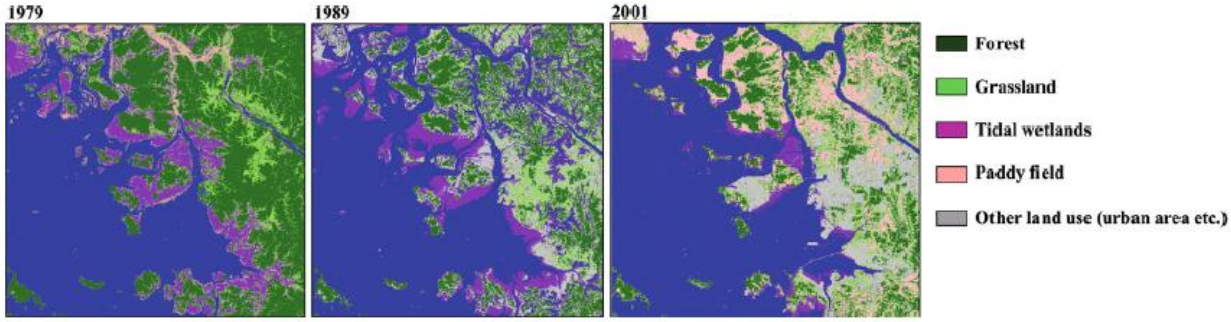
Figure 1.1 | Tidal flat in Suncheon bay

Source: MLTM (2010)

1.3 Problem definition

The two areas that have tidal flats and that are located in a highly populated area are: South Korea (in this research the name 'Korea' will be used) and the Netherlands.
In Korea there is a great tension between economy and nature. On the one hand, Korea is one of the four Asian tigers. These are relatively small Asian countries of which the economy has developed very fast in the last decades. Korea has developed from a deprived country in the 1960's to a high-tech modern country that it is now. Economic growth brought the country welfare and therefore people think it is important.
On the other hand, Korea has a unique ecosystem. As being part of the coast around the Yellow Sea, Korea hosts one of the richest tidal flats in the world and it is a hub for migratory birds. The problem is that in the last decennia large seawalls and dykes have been built around some tidal flats on a large scale and land has been reclaimed from the sea. This 'new' land will we used for building new housing, factories and infrastructure in order to respond to the demands of economic growth. Mainly in the past 30 years almost 50 percent of the tidal flats already have been destroyed due to land reclamation and in the near future that percentage will probably rise even more (Inglis & Rogers, 2010). This statement is visible in figure 1.2, which displays the disappearance of tidal wetlands from 1979 until 2001. The tidal flats are coloured purple and are disappearing on a fast pace (Hong et al., 2008).

Figure 1.2 | Disappearance of tidal wetlands



Source: Hong et al. (2008)

In the Netherlands there is also a tidal flat area that is called the ´Wadden sea´. The Dutch have a long tradition of struggling with the sea and the reclaiming of land from the sea and in that light a lot of land was reclaimed from the sea in the Netherlands. But the last decennia the environmentalist discourse has become more and more dominant. The Dutch tidal flats are more or less protected and for example it was enlisted to the UNESCO world heritage list in 2009.
It is an interesting problem, because these two areas seem to have similarities in the uniqueness of their tidal flats, but at the first sight it looks that the both countries have different approaches to how to use and manage the tidal flat. The Netherlands for example are quite protective about their Wadden sea and in Korea the tidal flats seems to be subordinate to their economic interests. It is therefore interesting to investigate what the differences and similarities are between the two tidal flats, how different approaches and management towards more or less similar ecosystem could lead to different outcomes and finally what Korea and the Netherlands can learn from each other regarding their use of tidal flats.

1.4 Objectives

The Netherlands and Korea are both highly populated countries and they both have unique areas that are tidal flats. Therefore the objective of this research is to get an insight in what the differences and similarities are between the two countries regarding the use, approach and management of tidal flats and what the Koreans and the Dutch can learn from each other. Especially in the light of the tension between economic development and nature.

1.5 Research question

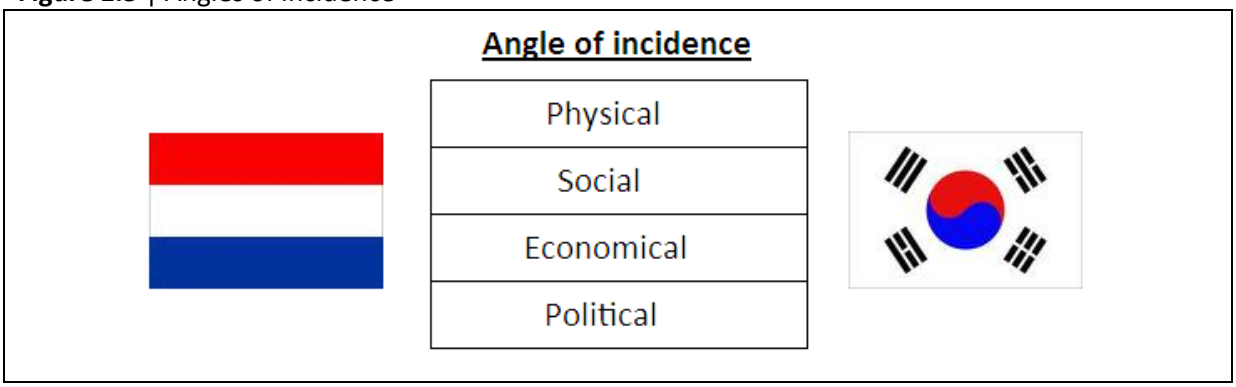
In order to achieve the objectives mentioned above, it is necessary to have good research questions. By doing this research there will be attempted to find an answer to the following main question:

What lessons can Korea and the Netherlands learn from each other, regarding the use approach and management of tidal flats?

1.6 Sub questions

To give an answer to the main question, it has to be divided into several sub questions, in order to make the main question more operational. Each sub question will be answered from a different angle of incidence and the four angles in this research will be: physical, social, economic and political (figure 1.3). This distinction will lead to the following sub questions:

Figure 1.3 | Angles of incidence



Sub questions:

- What are the differences and similarities between the tidal flats in Korea and the Netherlands in physical terms? (Geology, Geography, Ecology)
- What are the differences and similarities between Korea and the Netherlands regarding the use of tidal flats in economic terms? (Demography, Economy)
- What are the differences and similarities between Korea and the Netherlands regarding the use of tidal flats in social terms? (History, culture)
- What are the differences and similarities between Korea and the Netherlands regarding the management of tidal flats in political terms? (Politics, Juridical)

1.7 Research area

In order to do this research the research area has to be defined. The research area contains two areas: one in Korea and one in the Netherlands.

In Korea the tidal flats are on the west- and south coast of the Korean peninsula and therefore the research area will be this particular part of Korea. Due to land reclamation projects the tidal flats are disappearing on a fast pace and in this area there is a tension between economy and nature. Especially in the North West part of Korean (where the cities of Seoul and Incheon are) this tension might be the strongest. In the Netherlands, the research area will be in the Northern part of the country this is where the 'Wadden sea' is located. Both cases will be describe more widely in chapter three.

1.8 Relevance

1.7.1 Social relevance

In general, it looks like that the Korean society is not worried about the huge reclamation of tidal flats and the consequences for the ecosystem. There is only a small part of the population that seems to be worried about the impacts of land reclamation to the tidal flats. By this comparative research between the Netherlands and Korea, the Koreans might become more aware of the uniqueness of their tidal flats and that they maybe can learn from the Dutch in order to prevent the tidal flats from being lost forever. Therefore this research may have a social relevance.

1.7.2 Scientific relevance

This research has also a scientific relevance, because there has not been written much about the tidal flats in Korea. The literature that has been written about tidal flats in Korea are mainly about the ecological impact on tidal flats due to land reclamation. This research has to give an insight into several aspects and angles of incidence regarding the use, approach and management of tidal flats in Korea and the Netherlands. Most literature that has been written about tidal flats is very often about areas that lie in very remote areas. But this research is a comparative study between two tidal flats that are in two highly populated countries and this is where the tension between nature and economy is probably the strongest and therefore this research can be useful.

1.9 Bookmark

After this chapter of introduction to the research, the second chapter will included all kinds of theories that have been written about the tension field between nature and economy, about wetlands, tidal flats and tidal flat management. After that the methods and techniques that will be used in this research will be explained and motivated in chapter 3. In the chapters 4, 5, 6 and 7, there will be made a comparative analysis of the Korean tidal flats related to the Dutch context. Every chapter will be written from a different angle of incidence, namely: physical, economic, social and political. Finally, in chapter 8 some conclusions will be drawn, the main questions will be answers, there will be a critical reflection towards the research and suggestions for a further research will be done.

Chapter 2: Theoretical framework

2.1 Introduction

This chapter will focus on the theoretical framework of this research. The main concern of this research is to make a comparison between two unique wetland areas in the world, namely the tidal flats areas in Korea and the Netherlands. In these wetland areas there is a tension between nature and economy. In this tension field there are all kind of stakeholders who have their own interest in what to do with the tidal flat areas. In this chapter, will be described first what nature and economy are, how these concepts can be related to each other in a tension field and what kind of approaches there are towards nature. Also wetlands will be described briefly and there will be zoomed in to the concept of tidal flats. Tidal flat areas that are characterized by an interaction between the human society and natural systems (Klostermann, 2011). Therefore some relevant angles of incidences how to govern such a human-nature system will be set out.

2.2 Nature

The starting point of this research is the tension field between nature and economy, that is present in tidal flats in highly populated areas like Korea and the Netherlands. In order to get a better understanding of how nature and society are related to each other both concepts have to be defined.

Nature is a concept that is used a lot in daily life and for many people nature is something similar to plants and animals, but the concept of nature has several meanings. For example, the most simple definition of nature is given by the van Dale (2011), they say that nature is something that has not been modified by human beings. But according to Castree (2005) it is not possible to give a clear and comprehensive definition of nature and Williams (1983) even indicates that the word 'nature' is perhaps the most difficult word in the (English) literature. In general can be said that there are three different meanings of the concept of nature that can be (Demeritt, 2002 and Castree, 2005);

1. the essential quality or character of something
2. an inherent force
3. the external material world itself, non-human world.

Knox and Marston (2003) note that nature and society are interrelated and emphasize that nature is a social creation as well as the physical universe that include human beings. Nature is therefore not just an object, but it is also a reflection of society in that philosophies, belief systems and ideologies shape the way people think about an use nature (Knox & Marston, 2003).

Functions of nature

Castree (2005) said that it is not possible to define nature, but de Groot (1992) says that at least a large number of functions of nature can be identified. This wide range of functions and ecosystem services can be grouped into four main categories, namely the production, carrier, inspirational and regulating functions. These four main categories will be described below (De Groot, 1992).

- Production function

This first function of nature is about the dependency of human on nature for production. Humans depend on plants and animals for their food, fuel, pharmaceuticals and industrial products. Nature provides all these goods and services to society at low or no cost by natural ecosystems.

- Carrier function
  The second function is the carrier function, this includes the space ecosystems provide for human activities, such as settlements, agriculture, recreation, tourism and nature protection.
- Inspirational function
  The third group of functions are the inspirational functions, which is about all the opportunities for cultural, intellectual and spiritual activities. Human-beings are interested in nature, regarding the popularity of eco-tourism, bird-watching, wildlife films and gardening. Nature makes it pleasurable for humans to exist on earth.
- Regulation function
  The last group of functions is the life-support and regulations function. This group of functions deals with the processes and services that nature provides for the maintenance of a healthy environment. For example clean air, water and soil, flood control, carbon storage and waste absorption.

2.3 Economy

Like nature, the concept of economy is also used daily in a different way and in a different context, but what does it actually mean? As a starting point a simple definition is given by van Dale (2011). Economy is the science that studies the human strive to welfare or the whole of financial facilities, trade and industry of a country (Van Dale, 2011). Blom & van Soest (2003) make a similar distinction in the concept of economy, namely into economy as science and economy as a collection of activities. The economic science assumes that the needs people have are infinitely large and very diverse, but the resource to gratify these need are limited. Therefore people have to make rational choices. From a scientific point of view people try to gratify as many needs as possible in a little effort and budget.
The concept of economy is not just about science, but is also about the whole of production, consumption and the division of scarce goods and services. But they have one thing in common, namely both cases have something to do with gratification of needs and scarcity. The definitions which are described above are quite narrow. They mainly deal with production of tangible goods and services, but economy and the gratification of needs is more than just financial transactions. In what way economy can more than just financial values and how the concept of nature and economy are related to each other will be described in the next paragraph.

2.4 Nature is economy?

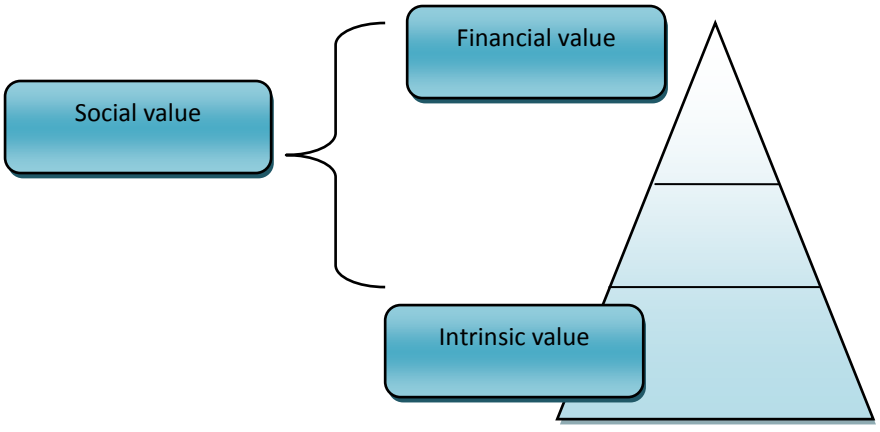
In the paragraphs before the concepts of nature and economy were described and in daily life these concepts are generally seen as water and fire. But both concepts do not stand on their own. Blom & van Soest (2003) say that there is not a contradiction between nature and economy, but humans are part of nature, nature provides for the needs of people and therefore nature contributes to people's welfare.
First of all, it is good to mention that nature is a production factor just like labour and capital, though that it is a scarce production factor. Second, nature is a consumption good. People

are able to experience, undergo, enjoy and appreciate nature. This provides utility and can therefore contribute to people's welfare, although this is hard to actually measure.
Besides the statement that nature is a production factor and a consumption good, there are also some characteristics of nature
First of all, nature is a special kind of product or good, with special qualities. According Blom & van Soest (2003) a lot of nature has the characteristics of a public good, it is there for everybody and has especially values when the nature is there for everybody. An individual cannot buy 'nature' by itself like normal goods. But when the public good is there, all the people can benefit from it. Of course in reality there are parts of nature that are in private hands of individuals, but in general nature has the characteristics of a public good.
The second characteristic of nature that distinguishes it from other good is that it is an irreplaceable good. According to Heertje (1976) a difference between replaceable and irreplaceable goods have to be made. Replaceable goods can be produced over and over again in the same way, for example a loaf of bread. Irreplaceable good have a unique character, namely that after they have been made they cannot be made again. These goods are rare and when they are being destructed somehow, they can be restored or rebuild in a way, but they can never be restored or replaced in all unique aspects. Because of the irreplaceable character of nature is problematic to give an economic value to nature. This makes it hard to compare nature with other replaceable goods. For example, it is hard to compare a replaceable good like an industrial complex with an irreplaceable area of nature.

To give better insight in the vales of nature Ruijgrok (2000) distinguishes three different kind of values of nature, namely the financial, social and intrinsic values (Figure 2.1).

- Financial value
  The financial value of nature is the direct revenues of the nature. For example, the entrance of a nature park or the cash flows of companies that are dependant of nature. Under normal circumstances the financial value is expressed in a market price, but this is not the value of nature. The financial value is just a 'top of the iceberg' of the values of nature, there are other values than just the financial value.
- Social value
  The social value is equal to the contribution of nature to the social welfare. This is the material and immaterial utility of the entire society (Blom & van Soest, 2003)
- Intrinsic value
  Is also called the ecological value of nature and means that nature is regardless of the existence of men and that nature has meaning of itself.

Figure 2.1 | Three values of nature

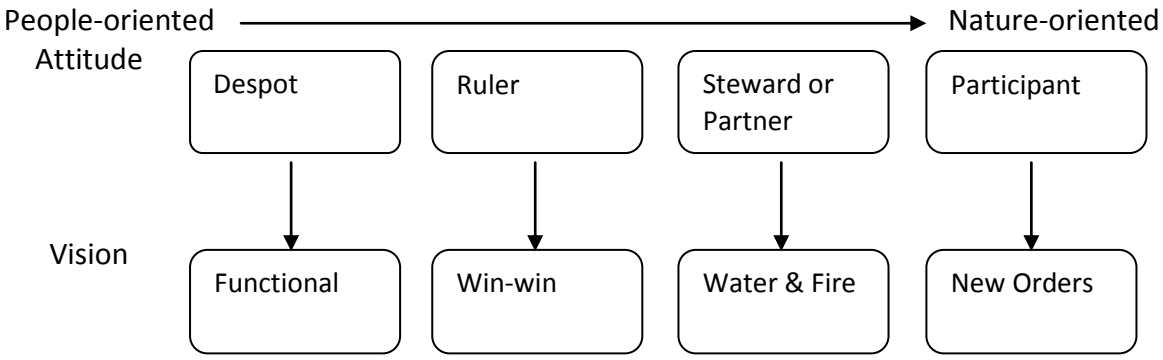


Source: Blom & van Soest (2003)

2.5 Visions to nature and economy

There are different ideas towards nature and the relation between humans and nature. According to Blom & van Soest (2003) there are different attitudes that highly determine individual's personal assessment and selection processes. These attitude decides the meaning of nature by man.
On the spectrum of human-oriented (anthropocentric) and nature-oriented (ecocentric) Blom & van Soest (2003) distinguish four types attitudes and visions, which are visualized in figure 2.2 and are described below. Of course there are nuances and ideas that lie in between these four type, but these four are the most commonly described attitudes and visions.

Figure 2.2 | Visions on nature and economy



Source: Blom & Soest (2003) Edited by Heslinga (2011)

Figure 2.2 explained showed that the four attitudes distinguished by Blom & van Soest (2003) lead to four different vision on nature. They will be described briefly below.

1. *Functional:*
   According to the functional vision nature has only got values for mankind. Man can fully use nature for the gratification of their needs. Nature then is comparable with other products and services. Nature has got only values for mankind and no existence by itself. The most important mechanism for consideration is the market mechanism. The supply of nature is matched with demand for nature on the market. In case of scarcity of nature, the market mechanism will appear and more investments will be made in new nature.
2. *Win-win*
   In the win-win vision financial-economical interest and nature go hand in hand. The challenge is to find win-win situations of which nature can benefit. In this vision there are positive feedback interests. This means that economic growth increases the opportunities for natural conservation and –development and conversely natural conservation and –development is good for economic growth. In the win-win vision is attempted to optimize the economic and natural stock in order to maximize the social welfare for all the actors.
   Nature is multifunctional in the win-win vision. Not just the quality of the nature itself is central, but also recreational and economical function of nature is important

and the quality of the living environment. Multi-functionality in this case means that there is also a shared responsibility between the government, private parties, citizens and social organizations.

3. *Water & Fire*
   The water and fire vision assume that nature and the production of goods and services cannot go together. According to this vision does economic progress lead to natural decline and conversely. The water and fire vision emphasizes that there was to be a consideration between nature and economic production and that choices have to be made. The rising demand for land for economic purposes is inconsistent with conservation of nature. These choices over de use of space find their impact in the spatial planning.
4. *New Orders*
   This last vision gives a new view on how economy and nature can be balanced with each other. This vision is commonly known as Deep Ecology and in this vision man is seen as being part of nature. Man is not a ruler, steward or manager of nature, but one of many organisms that exists in it. There is a strong emphasis on nature education and nature experience, this is to learn and experience that man is itself is part of nature. Deep Ecology builds on ancient mystical and spiritual traditions which are described in the worlds' religions and play an important role for the indigenous people.

2.6 Wetlands

2.6.1 Defining wetlands

After describing concepts like nature and economy it is time to zoom in more on the area of this research step by step. This research deals with the use of a certain type of ecosystem, namely wetlands. The first step is to define what a wetland is. It is not easy to give a clear definition of wetlands. This is because there is a huge variety in wetland types and it is hard to define their boundaries, because they evolve over time. A starting point to get a better understanding of what a wetland is, is the following definition given by Keddy (2010):

> *"A wetland is an ecosystem that arises when inundation by water produces soils dominated by anaerobic processes, which, in turn, forces the biota, particularly rooted plants , to adapt to flooding".*
> *Source: (Keddy, 2010).*

This definition of wetlands is very broad and includes nearly everything ranging from tropical mangrove swamps to subarctic peat land. Nevertheless, some things can be said about wetlands. First that a wetland is a transitional zone between permanently wet and generally dry environments. Wetlands cannot be classified as either aquatic or terrestrial (Barbier et al., 1997), but could be described as a mix of the characteristics of terrestrial areas and the characteristics of aquatic environments (Lyon, 1993). Because of the mix of these characteristics a unique habitat of life and earth processes is create, but this makes wetlands hard to identify and define them (Lyon, 1993). The other important feature of wetlands is the presence of water for a significant period of time. This water changes the soils, microorganisms, plants and animals.
Another way of defining what wetlands are, is by looking at the definition of the Ramsar Convention of International importance. This definition is widely accepted as a definition of wetlands, because over 100 countries signed this convention.

"areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six metres" (Ramsar convention article 1.1)

2.6.2 Functions of wetlands

At least some functions of wetlands can be described in order to explain why wetlands are so important. Wetlands are indispensable for all kind of bird species and especially migratory birds, because wetlands are the ideal place for migratory birds to rest and feed. Besides that, wetlands are also important for other animals that are dependant of water. In shallow coastal areas, wetlands are like a nursery area for fish and other sea animals. But next to ecological functions, wetlands have other benefits, namely: wetlands form a buffer against flooding, can be used for drinking water and are beautiful areas for recreation and the living environment. The examples of the functions which mentioned above, are just a few functions of wetlands. Whitten and Bennett (2005) distinguish more functions of wetlands, which can be seen below and what is striking that there are not just ecological functions of wetlands.

- flood control
- flora and fauna production
- sediment accretion and deposition
- ground water recharge
- ground water discharge
- water purification
- storage of organic matter
- food-chain support / cycling
- water transport
- tourism and recreation
- contribution to climatic stability

The definition of wetlands given above give some understanding of what wetlands are, but they are still very broad definitions. Mitsch & Gosselink (1986) say that because the characteristics of wetlands differ from aquatic to terrestrial, any definition of a wetland is arbitrary. Therefore there is no single definition of a wetlands that is recognized everywhere. Because of this, there is confusion and inconsistencies in the management, classification and inventorying of wetlands systems. But this is not a surprise, considering the variety in types, sizes, location and the conditions of wetlands.

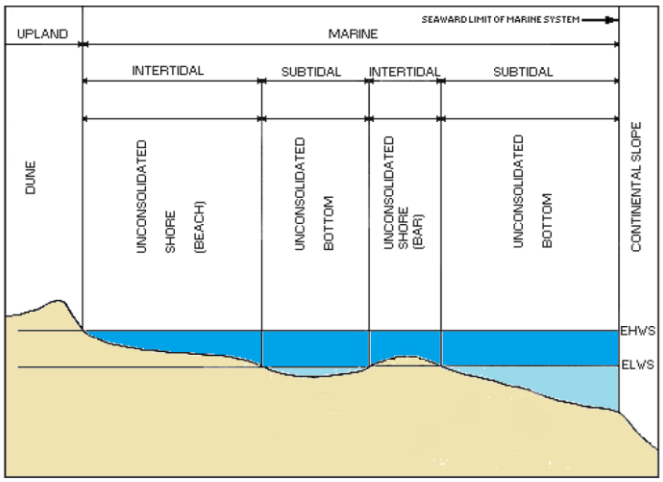
2.6.3 Wetland systems

For this research it is better to focus more on the specific types of wetland systems and classifications that are the most useful for this research, instead of defining what a wetland is. First it is important to make a distinction between interior wetlands and coastal wetlands. The difference between these two type of wetlands is that interior wetlands deals with fresh water and that coastal wetlands are influenced by salt water (Keddy, 2010). In this research only the coastal wetlands will be examined.
Cowardin et al. (1979) gives an even more specific classification of the different types of wetland in a broad overview of all the systems and subsystems in which the wetlands are

divided. The five systems are marine, estuarine, riverine, lacustrine and palustrine and they will be described below. Since this research will only focus on the coastal wetlands only the marine and estuarine wetland systems are relevant. Both relevant systems will be described more into detail below.

- Marine system
  Marine wetlands are wetlands that are exposed to the waves and currents of the open ocean. The water regimes of this areas is determined by the ebb and flow of the tides of the oceans and is not influenced by river flows, for example the shoreline along the coast

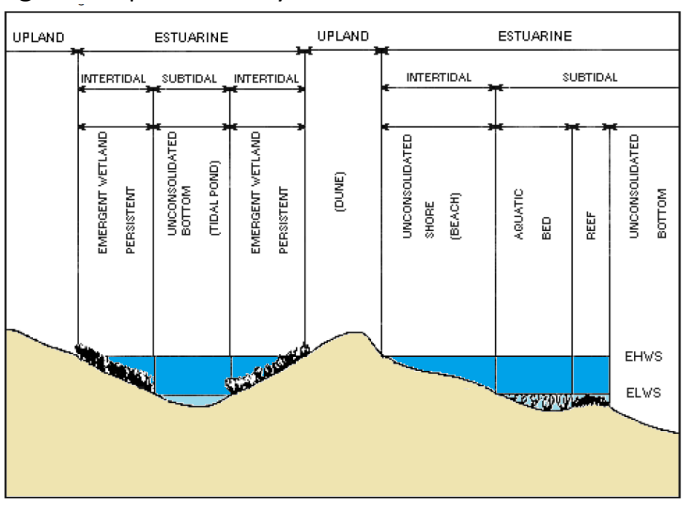
Figure 2.3 | Marine system



Source: Cowardin (1979)

- Estuarine system
  The other system is the estuarine system and this is where rivers meet the sea. The salinity is between salt and freshwater, and then called brackish. The estuarine system can includes both estuaries and lagoons. In comparison with the marine system, the estuarine system is more strongly influence by the land. Examples of areas with the estuarine system are deltas, mudflats and saltmarshes.

Figure 2.4 | Estuarine system



Source: Cowardin (1979)

- Riverine system
  Areas that fall into the riverine system are areas where land is periodically flooded by rivers, for example water meadows or oxbow lakes.
- Palustrine system
  Wetland areas in the palustrine system are areas where there is more or less permanent water, for example swamps, marches or fens.
- Lacustrine system
  Like the palustrine system the lacustrine system also contains areas with permanent water, but in this case the water does not flow, for example ponds, kettle lakes and volcanic crater lakes.

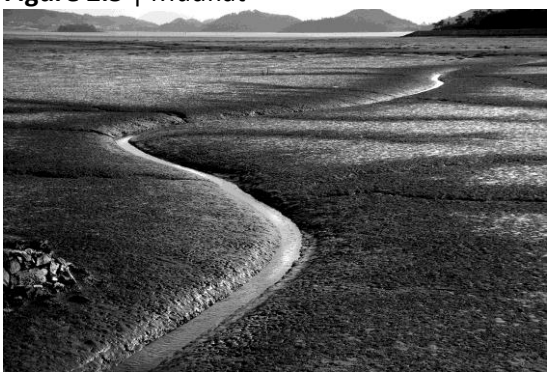
2.7 Tidal flats

In the previous paragraphs was attempted set out what wetlands are and what kind of wetland systems there are. This research focusses on marine and estuarine wetland systems. In this paragraph the concept of 'tidal flats' will be discussed, but there can sometimes be a confusion of tongues between tidal flats, intertidal wetlands, mudflats and saltmarches etc. This is because in a lot of literature these concepts are used interchangeably. Therefore in this paragraph some defintions will be given and destinctions will be made. Though, in this research the term 'tidal flats' will be used, otherwise it would become too complicated, but it is good to mention that there are differences and nuances in the terminology.
First of all, it is necessary to make a distinction between the concepts of intertidal and subidal flats. According to Cowardin (1979) is a subtidal area, an area of which the sustrate is continuously submerged. That is different with an intertidal area, in that case the substrate is exposed and flooded by tides and this also includes the associated splash zone (Cowardin, 1979). Wheather an area is subtidal or intertidal has to do with the of amount of time that an area is submerged.

2.7.1 Mudflats

Mudflats are coastal wetlands that are formed by sediments (mud) from rivers and tides. They can roughly be found is bays, estuaries and lagoons. These mudflats are most of the time located in the intertidal zone and therefore flooded approximately twice a day.

Figure 2.5 | Mudflat



Source: Seo (2011)

Figure 2.6 | Saltmarch

Source: Ramsar (2010)

2.7.2 Saltmarches

A saltmarch is the part of the mudflat that can be found at the upperend the tidal flat. This is the part where the seawater can reach only when the tide is high. Saltmarches are actually former mudflat, but due to a complex proces of sedimentation a saltmarch can develop (Doody, 2008). It is the combination of sediment supply and physical location that helps to determine how big and where the saltmarch will develop. When the combination of tidal movement and waves are not eroding the settled sediments, accretion can take place. Because of accumulation of sediment the shoreline is rising and will not be flooded as much as is use to do. Salt tolerant plant species will appear and eventually the saltmarch is formed (Doody, 2008).

2.8. Classifications of tidal flats

Tidal flats might all look the same at first sight, but there are some differences in their appearance. According to Masselink and Short (1993) there can made some classifications of tidal flats by the tidal range, which can been seen in table 2.1. The tidal range is the difference between the low- and high tide. Masselink and Short (1993) distinguish three types of tidal flats by classification, namely: micro, meso and macro tidal flats.

Table 2.1 | Classification by tidal range

Classification:	Range:
Micro tidal range	<2 meters
Meso tidal range	2 -4 meter
Macro tidal range	>4 meter

Source: Masselink & Short (1993)

Besides a classication in range there can also be made a classification by topographgy. According to Doody (2008) there are different types of tidal flats in geographical appearrance. This classifcation of tidal flat types are of course ideal types, in reality there are all kind of mixed forms posssible. These types are described below and visualized in attachment 5.

1. Open-coast tidal flat: These are flats that have been developped without any barrier islands. Therefore tidal currents and sea waves have greatly influences the creation of the landscape.
2. Estuarine tidal flat: The estuarine tidal flats are formed in areas along the coast where large rivers flow into the sea. In this place the fresh waster from rivers and the salt water from the sea come together and become brackish.
3. Embayed tidal flat: The embayed tidal flats are tidal flats which are formed in bays.
4. Lagoonal tidal flat: A lagoonal tidal flats looks a little bit like the embayed tidal flat, but the difference is that the gap where the seawater can come trough is much smaller. Because of that, the lagoonal tidal flats are very shallow.
5. Deltaic coastal tidal flat: In this case the sediment that comes from a river is spread out over a delta before it reaches the coast.
6. Barrier island flat: This last type of tidal flats has barrier island in front of the coastline, because of that the high enery waves are blocked by these island and the tidal movement takes place between the shore and the barrier islands. A good example of this type of tidal flats is the Wadden sea in the Netherlands.

2.9 Tidal flat management

In the previous paragraphs the tensionfield between economy and nature was explained, the concept of wetlands was discussed and the concept of tidal flats was described. Next to the use of the tidal flat areas in both Korea and the Netherlands, the main concern of this research is how to manage areas like tidal flats.
According to Klostermann & Toonen (2011) a tidal flat area is a system that is characterized by an interaction between human society and natural systems. In this paragraph some theoretical frameworks will be described, that can contribute to a good analysis of the management of a complex system like tidal flats. There are not many theoretical school that investigate nature and society in the same framework (Klostermann & Toonen, 2011).

2.9.1 Natural resource management

Natural resource management can be interesting for the management of areas like tidal flat areas. The startingpoint of natural resource management is a concept called 'Tragedy of the commons' (Hardin, 1968). In his article, Hardin describes that of exhaustion of a shared resource is inevitable, this is because multiple individuals act independently, rationally and in their own interest and therefore it is in the advantage of an individual to use the natural resource for their own benefit.
It is not easy to prevent the shared resources for being exhausted, Nhantumbo (2003) comes with an atttempt to manage the natural resources in a form of co-management called 'Community Based Natural Resource Management' (CBNRM). The local community is the most important actor and higher governmental levels also play a role, but eventually they have to seek for a balance between the higher and lower level. Important parts of CBNRM are the decision–making power, ownership of resources, access to sources of funding and access to markets. Education and selforganization are the instruments to achieve CBNRM.

According to Nhantumbo four stakeholders play a role in CBNRM and these stakholder might have an overlap with each other in some cases.

1. Local communities (People who live and work in an areas)
2. Governments (Both local and national governments are important for the creation of legal frameworks and the implementation of the policy)
3. Privat sector
4. NGOs (Passionated minorities, who make people aware about natural resources)

In order to prevent the exhaustion, strong institutions are necessary to make geographical boundaries, make clear rules for the use of resources and see the importance of local knowlegde about the resources.

2.9.2 Social-ecological systems (SES)

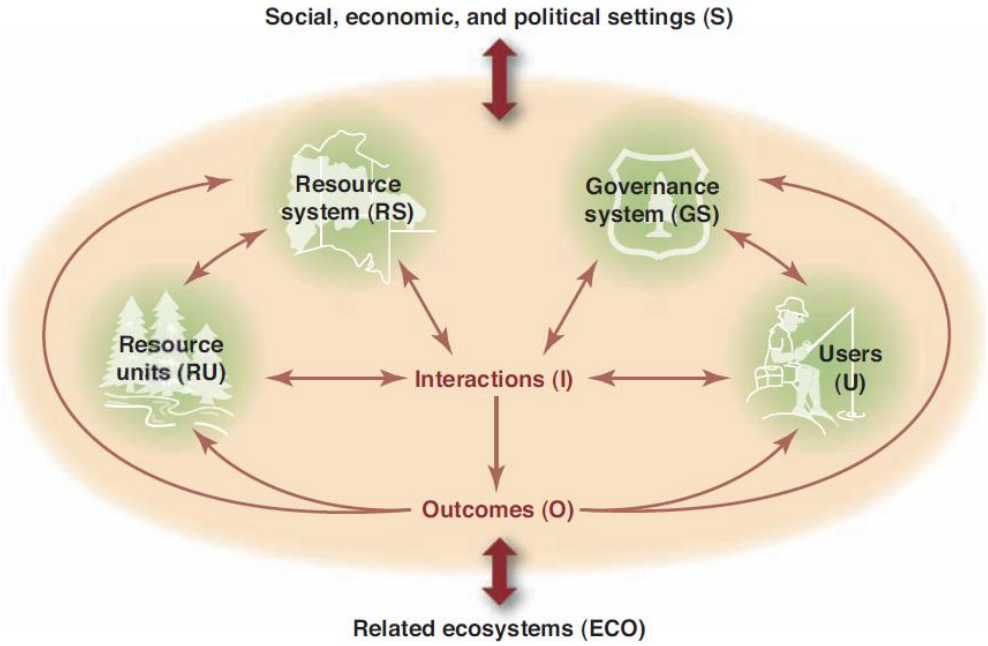
All the resources that are used by human are embedded in complex social-ecological systems (SES's). Ecological and social sciences have developped independently and therefore they are not easy to combine. Ostrom (2009) provides a general framework in order to get a better understanding of complex SES. In the framework Ostrom (2009) describes different subsystems that are interelated, these subsystems are the following:

1. Resource systems (A specified area containing resource units)
2. Resource units (Elements that occur in the resource systems)

3. Governance system (The government and other organizations that manage the area, the specific rules about the use of the area and how these rules are made)
4. Users (The individuals that use the area in different ways)

Figure 2.7 shows the subsystems of the SES and how they interact with each other, but also how they are related to social, economic and political settings and related ecosystems.

Figure 2.7 | Subsystems in a framework for analysing social-ecological systems



Source: Ostrom (2009)

In the last years, connections have been made between the natural resource management and the social-ecological systems. According to Ostrom (2009) the sustainable management of social-ecological system can only succeed by self-organisation. Top-down measures from superior governments are often too simple for complex systems like social-ecological systems and therefore people have to develop institutions themselves, in order to prevent their natural resources from being exhausted. There are ten factors which are important to understand sustainablility and help to explain wheather or not people are able to realize self-organisation (Ostrom, 2009)

1. *Size:* The size of the resource system is important for selforganization. Systems that are too large are diffcult to define and systems that are too small might not be worth for people to invest in.
2. *Productivitiy:* System which are exhausted or are in abundance are less likely for people to invest in.
3. *Predicablitiy:* This is necessary to develop some rules for the use of the system
4. *Mobilty:* Moving resources are harder to monitor than resources that stand still.
5. *Amount of users*: A larger amount of users can create difficulties to negociate with all the stakeholders, but it can make monitoring more easy.
6. *Leadership:* Strong and respected leaders are good for self-organisation
7. *Norms and social capital:* When there are shared norms and mutual trust in the group of users, it is easier to achieve self-organization.

8. *Knowlegde:* If the users don't have enough knowlegde of the system and therefore not enough support for the system, the changes that the system will be destroyed are more likely.
9. *Importance:* When the users of the resource don't think that the system is important, people are probably not willing to invest in developing rules for the maintainance of the system.
10. *Self-determination:* When people have the right to develop rules for their areas, it is more likely that people will self-organize. People will probably not invest in developing rules, when they are overruled by a higher power.

2.9.3 Governance:

Ostrom (2009) said in the previous paragraph that the sustainable managment of social-ecological system can only succeed by self-organisation. A way to make this possible could be a new form of realizing government policy, namely governance. In the last couple of years more international attention has been given to governance, which is the development of new forms of cooperation between the market, society and governments (Van Dijk & Folmer, 2009).
Multilevel governance has both a vertical and horizontal dimension, which means that networks appears between different sectors of policy and other actors next to the government (Bache & Flinders, 2004). An important observation is that governments from different levels are interdependent in the development and execution of policy and therefore a government cannot function fully hierarchical (Bache & Flinders, 2004).
According to Van Dijk & Folmer (2009) an approach such as multilevel governance has benefits, namely it can break through a locked in situation between contrasting actors, it can enlarge the space for negotiation and decisiveness on the administrative level and it can help to create support for sustainability.

Good corporate governance and good government governance are widely discussed issues, but a further analysis shows that the governance of the Commons involves three levels (Toonen, 2009):

1. *Operational choice or management level*
   For the management rules aimed at goal achievement, responsive and efficiency are necessary. Clear goals and a goal-oriented approach are desirable.
2. *Collective choice or governance level*
   This level is about getting trust in the policy and support for rules by involving stakeholders in developing rules and defend the legitimacy of these rules by monitoring and maintenance. Procedures for negotiation in conflicts of interest and rules for conflict management are required.
3. *Constitutional choice or institutional design level*
   In order create a stable and solid management, resilience is important and the learning ability of managerial systems to deal with changes, ambiguities, uncertainties, crises and calamities (Toonen, 2009). This cannot be done by central management and the involvement of local groups is therefore necessary.

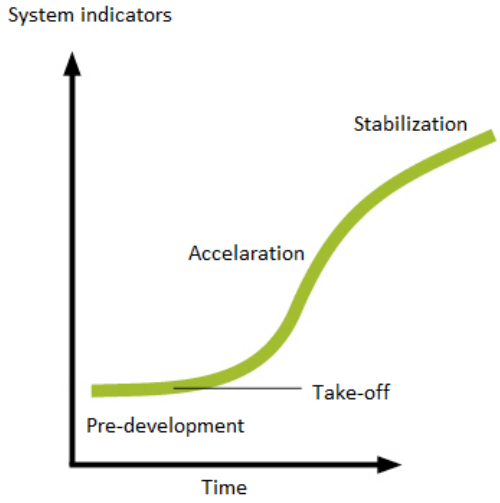
2.9.4 Transition management

The core business of transition management is the concept of transition, which can be seen as a proces of structural change in society. Nowadays this concept can be used to describe

processes of change in society. Transitions take place when a dominant structure in society is under pressure by external change and/or internal innovation. According to Rotmans (2003) transitions can be charcterized by the following characteristics: first of all they change society in a fundamental way, they take place gradually and last at least a generation. Also a transition includes technlogic, economic, ecologic, social-cultural and institutional developments, which can influence and strengthen each other. Finally, a transition is a consequence of slow changes (stocks) and a fast dynamic (flows).

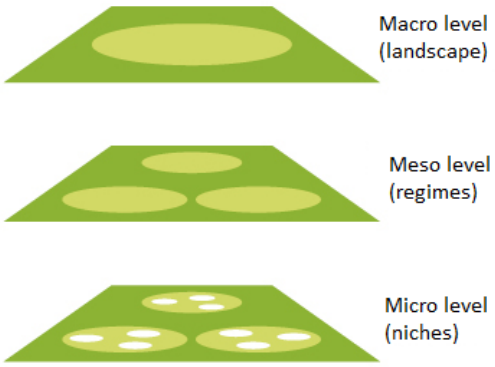
According to Rotmans (2003) development takes place at multiple levels, that is why a multilevel transitionmodel (figure 2.8) was created. This model distinguishes three levels on which developments can occure, namely the macro, meso and micro level. The macro level is the 'landscape', which consist of the ruling paradigms in society. The developments on this level take place quite slow. On the meso level developments take place within the technological systems, rules and institutions. These 'regimes' give resistance to change often, because they want to maintain the existing organizations and rules. On the micro level all kind of new developments can take place, these 'niches' can become the beginning of a system change.

Figure 2.8| Multiple phases model



Source: Rotmans (2003)

Figure 2.9 |Multilevel transition model



Source: Rotmans et al. (2001)

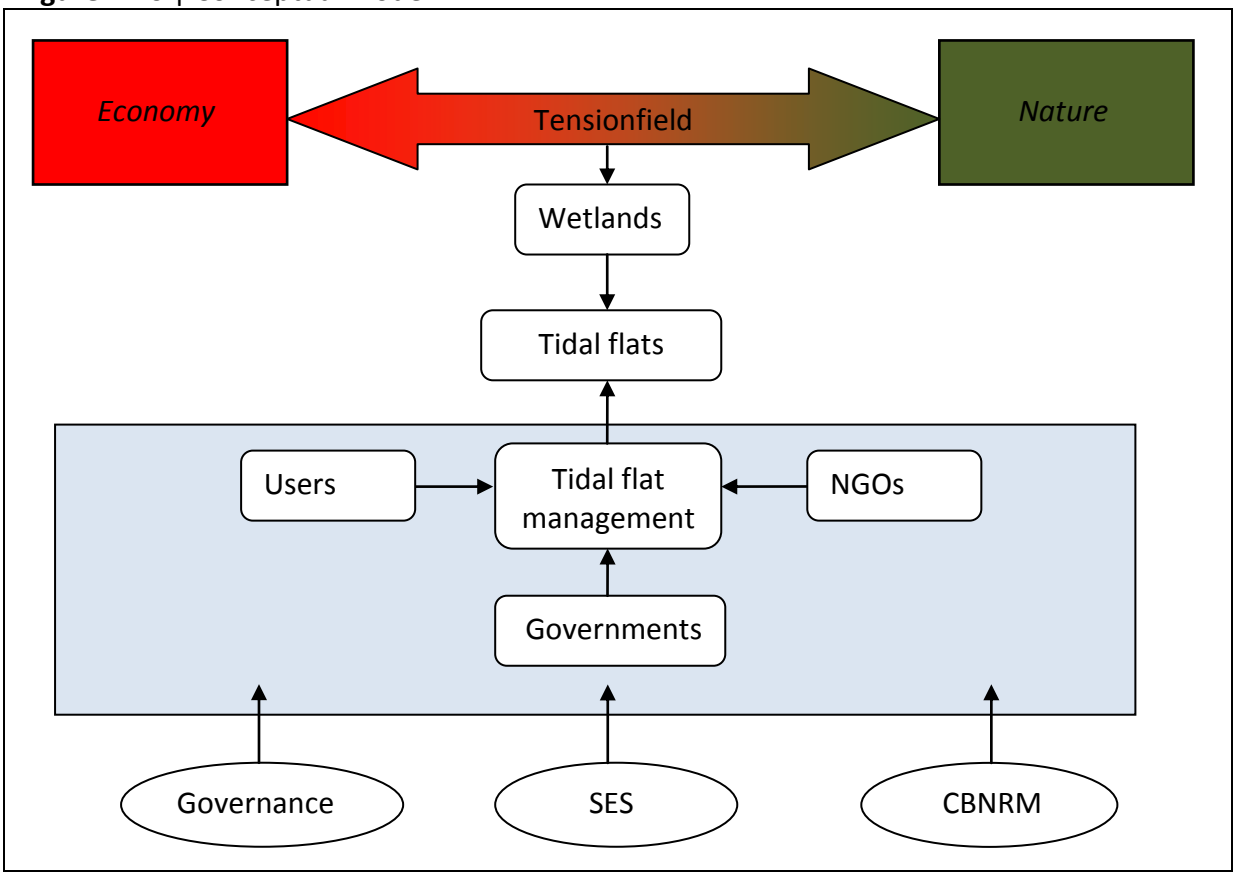
For transitions to succeed, all the three levels have to be connected and strengthen each other. The multilevel model can be helpful to describe the complex interaction patterns between individuals, organsiations, networks and regimes in a social context. For this research the multilevel model can be helpful way of thinking in describing the interaction patterns between all kind of actors dealing with tidal flats in Korea.

Rotmans et al. (2001) say that a transition is a proces and therefore takes place in through different phases, which can been seen in figure 2.9. These four phases are pre-development (dynamic balance, first appearance of a transiton), take-off (beginning of the process of change), acceleration (structural changes on all kind of field, which influence each other), stabilization (a new dynamic balance). For this research, this model can give a backbone to

the developments that have occured in Korea and in the Netherlands and can be helpfull in described in what phase they are now.

2.10 Conceptual Model

Figure 2.10 | Conceptual model



Source: Heslinga (2011)

Chapter 3: Methodology

3.1 Introduction

In this research will be investigated what Korea and the Netherlands can learn from each other, regarding the use, attitude and management of their tidal flats. In order to justify this research, the sources of the data should be explained. This is because this research has an explorative character and the data gathering is both qualitative and quantitative, therefore it is important to give a good description of how the research questions from the introduction chapter are operationalized in order to conduct a good research. In this chapter will be described what kind of methods and techniques were used to do this research and also why some decisions were made.

In this research two type of data were used, namely: primary and secondary data. Secondary data is the type of information that is already gathered by others and is available for other researchers to use for their own research (Flowerdew & Martin, 2005). The other type of data is primary, this is data that is gathered by the researcher itself. In this chapter both types of data will be reported.

3.2 Secondary data

Secondary data is data that has been gathered by others and is available for other researchers (Flowerdew & Martin, 2005). The advantage of this type of data is that is already exists and that it is relatively cheap and easy to gather. This kind of data gives a good contextual background for the research. Most of the times the quality of the data is good and therefore reliable. And often there is a lot of secondary data available.

But there are some problems with secondary data, which should be kept in mind. Secondary data is first of all a reflection of the goals and attitudes of the people and organizations that gathered the data. It is an abstraction of the real situation (Flowerdew & Martin, 2005). In this case information from Korea's ministry of Land, Transportation and Maritime affairs should be looked at with caution for example, because this ministry has certain interests and therefore their story might be coloured. Another problem is that different secondary data sources can be hard to compare with each other. Sometimes different areas or time periods are referred in different data sources. It could also happen that there is no secondary data available for a certain topic or area (Flowerdew & Martin, 2005). Moreover, data is not always suitable for the research and that makes secondary data inflexible.

3.3 Primary data

Primary data is data that is gathered by the researcher itself (Flowerdew & Martin, 2005). For this research different research techniques will be used, which will be explained more fully later in this paragraph, namely: interviews, a survey and observation. This means that both qualitative and quantitative data gathering methods are used. Before performing the actual research it good to mention that doing research in Korea can be different than doing research in the Netherlands. Therefore there are some things which should be kept in mind throughout the gathering of the primary data in Korea. Some important issues are the language barrier, the controversy of the topic and the social hierarchy in Korea.

Language barrier:

First of all, there is the language barrier between Korea and the Netherlands. Despite that Korea is an internationally oriented country, there are still not many Korean who can speak fluent English. In the universities there are people who can speak English quite well. But outside of Seoul and especially in the countryside it is not easy to find someone who can speak proper English. In the case of interviews and especially in a survey this could be problematic.

Controversial topic:
The destruction of tidal flats in Korea and the reclamation of land is a controversy in Korea. Especially since start of reclamation projects like Sihwa and Saemangeum, the subject of this research is sensitive. It could be possible that some people are not willing to talk about the subject freely, because of the threat of losing their job for example.

Social hierarchy:
Korea is a country with a hierarchic social system. Therefore I expect that people are not willing to be interviewed in fear of losing their job. Or that people are not certain of their ability to answers interview questions and then refer to their superiors or other departments.

3.3.1 Interviews
The main source for the primary data gathering will be interviews. Interviewing a specialist is the best method to gather information for this research. A specialist can oversee what is going on Korea regarding the tidal flats and anything that is related to it. Also the language barrier is probably a smaller problem, compared with doing a survey among Koreans for example.
A disadvantage of interviewing specialist is that nobody is completely objective, because each person can tell a different story depending on their interests. Therefore it is planned to interview all kind of specialist, varying from someone from the government, NGOs and scientists.

The questions for the interview have a semi open structure. This kind of structure makes sure that all the important question will be asked in the right order, but it also leaves space open to get more in to detail on certain issues. The first questions are short and simple in order to get the interviewer and interviewed get used to each other. These are questions like the name of the interviewed, for what kind of organization the interviewed works and what kind of job the interviewed does in that same organization. After that, the more important part of the interview starts and divided into three aspect. First there will be some questions about the economic situation of the tidal flat areas in Korea. Secondly, there will be some questions about how Koreans think about tidal flats and land reclamation and finally some questions that are related to politics and laws will be asked.

The locations of the interviews varied. In general there was planned to conduct the interview at a neutral place where it was quiet. But eventually interviews took place in several locations, like the office of KOEM, the Dutch embassy, the building of the ministry of LTM and in hotel lobbies. In order to minimize the risk of losing valuable information all the interviews where taped. This was of course with the permission of the interviewed.
Except for one, all of the interviews were done in English. The level of English of the people that were interviewed varied, but were all good enough to have a useful interview with. The interview at the ministry of LTM was done with the help of an interpreter which was provided by Korea University.
Not all the interview have taken place face-to-face. Some interviewed were afraid to give an interview in English or where unable to make an appointment because of the distance or the lack of time. Therefore these interviews where done by email. The disadvantage is that the interaction between the interviewer and interviewed is not there, but still the information can be useful.

→Recruitment of the respondents and the process
The step before gathering the actual data, is to find out who to interview. When I arrived in Korea I did not know anyone, therefore it was difficult to find respondents immediately. Luckily the supervising professor at Korea University Jun Koo was willing to help out. He could use his network of contacts to help me set up an interview with someone from a government department. The respondents for interviews with NGO's and scientist I had to search by myself. The starting point for this was the Dutch embassy in Seoul. I had an explorative conversation about the subject with Gert Stiekema (Agricultural Counsellor from the Dutch ministry of Agriculture, Nature and Food quality)

and I tried to identify who could be suitable to interview. The next step was to contact some NGOs and scientist and this was not an easy, because the people that were selected to interview where hard to reach by email. Some of them responded, but then answered that they reported that they might not be the right persons to talk to. Therefore I used the telephone, which made it easier to make an appointment for an interview.

3.3.2 Survey
In order to get a better view on what Koreans in general think about tidal flats, a survey will be conducted. Because of the language barrier the survey had to be simple and in Korean.
The question were translated in Korean with the help of a Korean friend and double-checked by other Korean friends. Besides the language problem the survey has to be short and the questions have to be clear. To make it easier for the Koreans that will be in the survey, the questions were supported by images. The full survey that has been conducted can be seen in attachment 3. The three questions that were asked are the following:

- What do you think about land reclamation projects?
  간척 사업에 대해서 어떻게 생각하십니까? \
- What do you think about the Saemangeum project?
  새만금에 대해서 어떻게 생각하십니까?
- What do you think is more important? Economic development or tidal flat protection
  다음 중 어떤 것이 더 중요하다고 생각하십니까? 경제 발전 / 갯벌 보호

For the first two questions the people could answer whether they think it is positive or negative. For the last question the people could say if they prefer economic development or the protection of tidal flats. To actually conduct the survey some Korean speaking friends were asked to help with translation if necessary. The survey will be held in and around the Saemangeum project and in the city of Gunsan. In order to get a good view of what the ordinary Korean thinks about land reclamation all kind of people will be asked varying from young and old and male and female. After doing the survey the gathered data will be analysed with the help of the statistical program SPSS.

→Recruitment of the respondents and the process
The survey was eventually conducted in different places in and around the city of Gunsan. Respondents were recruited at the city centre, the university of Gunsan, the Saemangeum project and along the way. There were hardly any people that spoke English well, therefore the help of some Korean speaking friends was very useful.

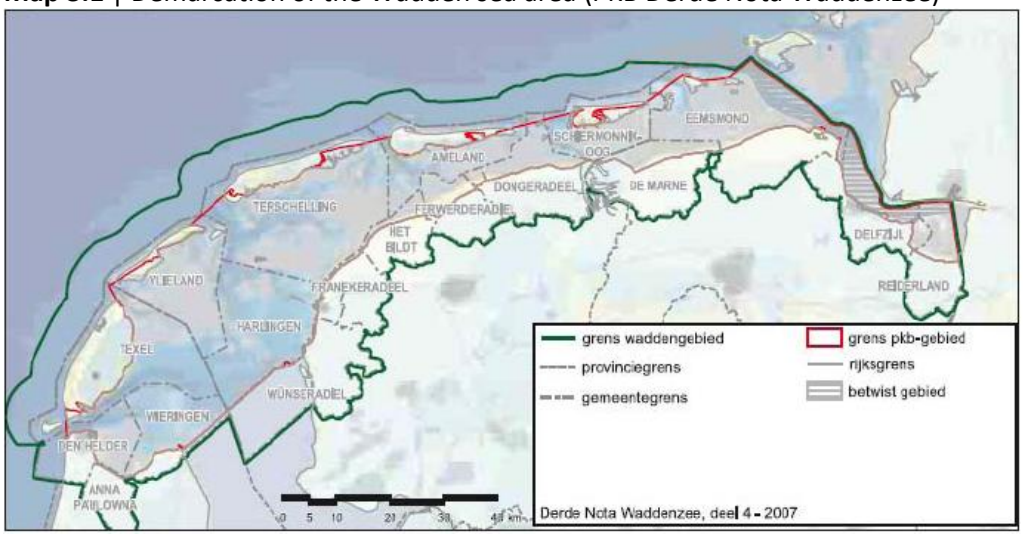
3.3.4 Observation
Most of this research will be done in and around Korea's capital Seoul, for example the literature study and the interviews. But in order to get a good image of what is going on in Korea regarding the use of the tidal flat areas, it is necessary to actually visit the area of research. Therefore some observation in these areas will be done. To get a good impression of the scale and the impact of a reclamation, the Saemangeum project will be examined and also some smaller tidal flats in the area.

3.4 Case selection
This research is about the comparison of the Wadden sea with the Korean tidal flats. Therefore it is good to give a demarcation of both the areas that will be researched, why these areas have been selected for this research and some remarks on how to compare these areas.

3.4.1 Case Netherlands
The tidal flat area in the Netherlands is called the Wadden sea. This area is a unique wetland areas and it is shared with Germany and Denmark. This research will mainly focus on the Dutch part of this

Wadden sea. To give a good demarcation of the research areas the demarcations of the PKB Derde Nota Wadden sea (2007) will be used, which can be seen in map 3.1. There are several demarcations on this map, but the darkgreen demarcation of 'grens waddengebied' will be used. This includes not just the tidal flat itself, but also the barrier island and the municipalities which are located next to the shore.

Map 3.1 | Demarcation of the Wadden sea area (PKB Derde Nota Waddenzee)

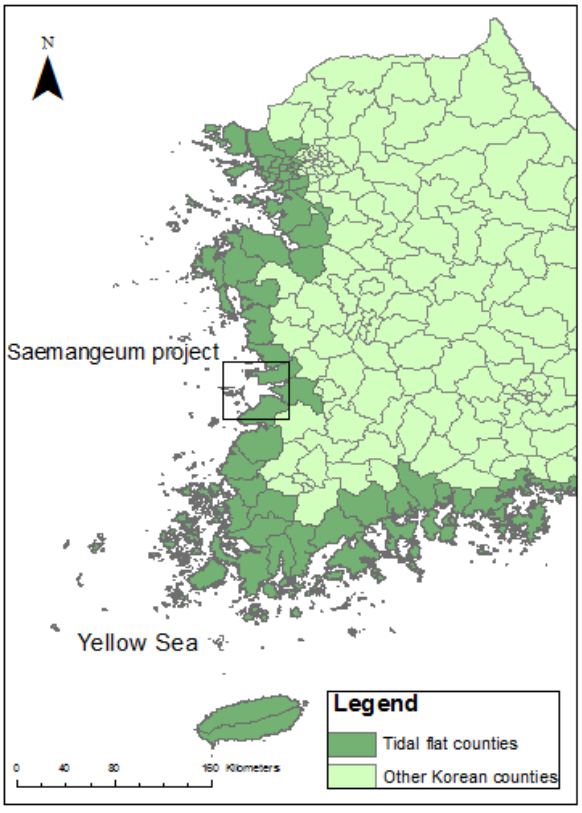


Source: Ministerie van VROM (2007)

3.4.2 Case Korea

The tidal flats in Korea are more like a mosaic of tidal flats ranging from small to large areas along the Korean coast (see Map 3.2). Roughly can be said that the area of research will be all the counties along the west- and south coast of Korea, but this is in an ideal situation where all the data per county is available.
Symbolic for the Korean case is the Saemangeum reclamation project (Map 3.2). In the tidal flats on the Korean west coast an enormous land reclamation project is being build. It is one of the biggest controversies in Korea and caused public awareness for the tidal flats in Korea. According to Choi (2006) the Saemangeum project is the barometer of sustainable development in South-Korea.

Map 3.2 | Demarcation of the tidal flat counties



Source: Heslinga (2011)

3.5 One-on-one comparison?

The best way to compare two cases is a one-on-one comparison. Unfortunately this is very hard to achieve because of the limited time for this thesis. Even more important is the difficulties to find and get access to the right data, because a lot of it is only available in Korean. Therefore, this research will contain a one-on-one comparison where that is possible. But most of the time the focus will be on the description of the Korean situation and this will be related to the context of the Dutch situation. In this way the use and management of tidal flat areas in Korea will be related to the Dutch viewpoint of the researcher supported by mainly literature.

Chapter 4: Physical similarities and differences between Korea and the Netherlands

The European Wadden Sea is not as unique in the world as we are used to believe. Along the entire West coast of Korea there is a long stretch of tidal flats up to 10 km in width (Kellerman & Koh, 1999).

4.1 Introduction

According to UNESCO (2010) the Korean tidal flats are different in terms of geography, geology, habitats and ecology. In this chapter will be investigated to what extent Korean tidal flats differ from those in the Netherlands in physical terms. This physical aspect of the comparison consists of certain parts. First of all, the geography of the both areas will be discussed. This is to get a good image of where the tidal flats in both countries are located and what their differences in appearance are. Second, the geology of the tidal flats will be viewed. This is because it is important to know to what extent these areas have undergone the same geological processes or not. Finally, a brief comparison between the ecology of the both areas will be made. This is important to know, because both areas are tidal flats with unique natural values. But to what extent do they differ, or do the two tidal flats show similarities.

4.2 Geography

In order to have better understanding of where the tidal flats in both Netherlands and Korea are, how they are demarcated and what are important geographical features of these areas, it is necessary to explore the geography of both areas shortly. In the theoretical chapter a distinction is made between mudflats and salt marches by Doody (2008), but in this research both types will be called tidal flats.

4.2.1 Netherlands

In the Netherlands the tidal flat is called 'the Wadden sea'. The Wadden sea is actually a tidal flat that stretches over three countries. It stretches from the Northern part of the Netherlands, along the German coast and finally until the Southwest of Denmark (see on map 4.1). This research will be mainly focussed on the Dutch part of the Wadden sea. But it is good to keep in mind that the Wadden sea is part of a bigger whole.

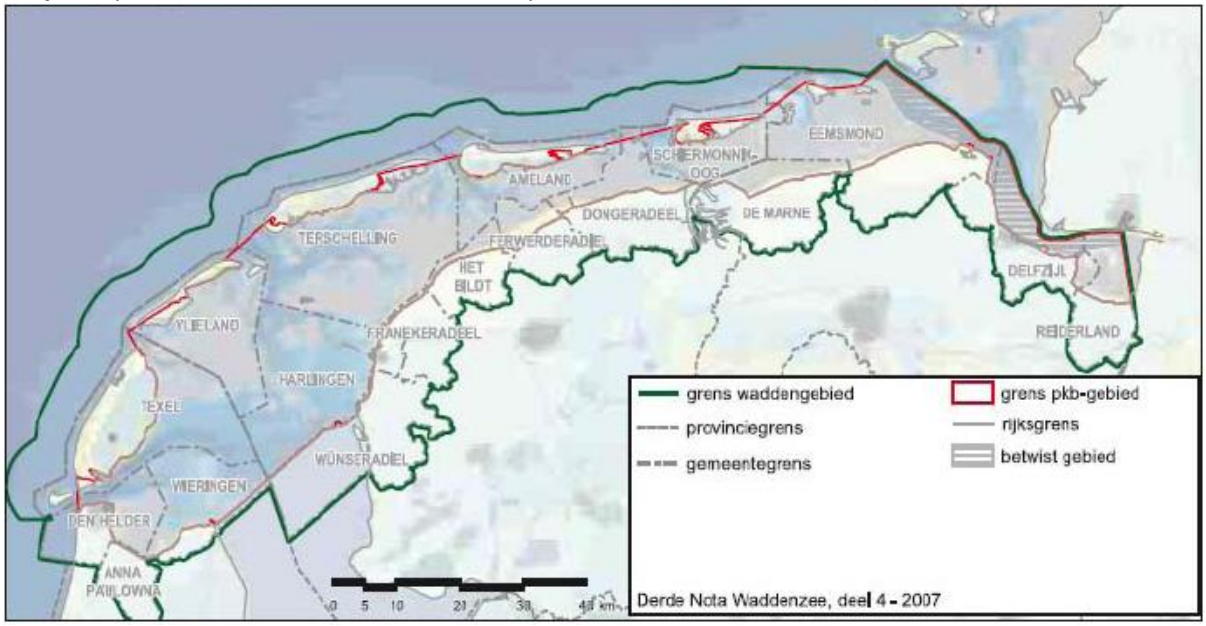
Map 4.1 | The three 'Wadden sea' countries

Source: Wikipedia (2011), Edited by Jasper Heslinga

The Dutch part of the Wadden sea stretches from the island of Texel in the West until the Dollard in the East. In map 4.2 there is an overview of the different demarcations of the Wadden sea. The red lined area is the actual tidal flat, but in this research the more broad demarcation of the Wadden sea area will be used. In map 4.2 that is the area that is demarcated by the green line and it includes the sea, the adjacent municipalities and the islands. According to Waddenzee.nl (2011) the total surface of the entire Wadden sea area is 488979 hectares (4889,79 km2), the surface of the tidal flat is 257266 hectare (2572,66 km2)

When looking further at this area it is striking that the Wadden sea is actually one big tidal flat, which is surrounded by the mainland and five large islands and some little (uninhabited) islands. Therefore the Wadden sea is characterised by the fact that is 'locked up' by the islands and that the seawater comes in and out through the gap between the islands.

Map 4.2 | Demarcation of the Wadden sea (PKB Derde Nota Waddenzee)

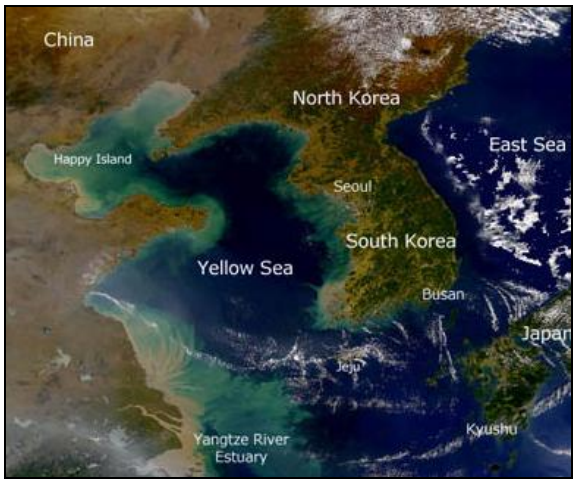


Source: Ministerie van VROM (2007)

4.2.2 Korea

Just like the Netherlands, the Korean tidal flats are part of a larger whole. The tidal flats stretch out along the Yellow sea. Besides Korea, the tidal flats from the Yellow sea can also be found in North-Korea and China (see map 4.3).

Map 4.3 | Tidal flats around the Yellow sea



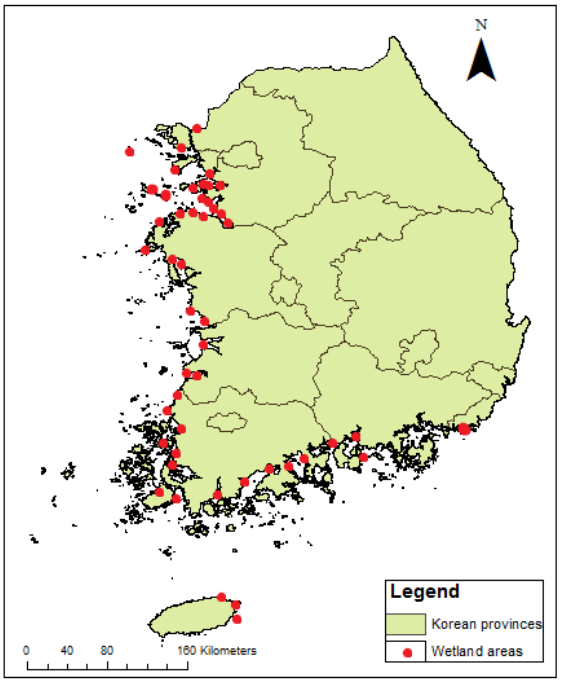
Source: Birds Korea (2005)

Before describing the tidal flats of Korea, it is good to have a broad picture of the Korean coasts. According to Hong et al. (2008) the Korean coast is almost 11.000 kilometres long, of which 6000 kilometre is mainland and 5000 kilometre is islands. Korea thus has a large coastline in comparison to the total land surface.

There are differences in the characteristics of different parts of the Korean coasts (Hong et al. 2008). The eastern coast does not have a lot of bays and becomes deep close to the shore and a lot of beaches can be found there. The west and south coast of Korea is diverse and intricate (Hong et al. 2008) and this is where the tidal flats can be found.

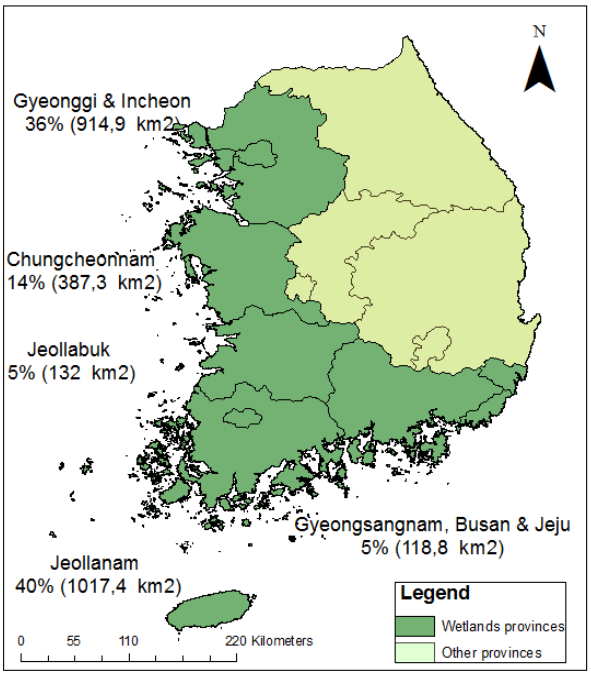
The Korean tidal flats have a total area of 2850 km2, which is stretched along the west and south coast of Korea. The tidal flats can sometimes be up to 10 km in width (Kellerman & Cho, 1999). Unlike the Wadden sea the Korean tidal flats are spread along the coast as a mosaic. Therefore the Korean tidal flats consist of lots of relatively small tidal flats, whereas the Wadden sea is more one coherent whole.

Map 4.4 | Korean tidal flat areas



Source: MLTM (2005) & Birds Korea (2000) Edited by Heslinga (2011)

Map 4.5 | Share of tidal flats per province in Korea



Source: MLTM (2005) Edited by Heslinga (2011)

Tidal flats usually develop along transgressed coasts, but the Korean tidal flats are surrounded by mountains. This makes the Korean tidal flats different from de Wadden sea (UNESCO, 2010). The mountains that are along the coast make the coast is relatively rocky and steep. In chapter 2 different classifications for tidal flats were described based on their tidal range. The tidal flat zones in Korea are quite narrow and steep and can therefore be classified as macro tidal flats. These are for example tidal flat with tidal ranges between 4 and 10 metre.

In chapter 2 six types of tidal flats were described, namely open-coast, estuarine, embayed, lagoon, deltaic and barrier island flats. Korea roughly has all of these types (except for lagoon and barrier island), therefore the Korean tidal flats have a wide variety of tidal flats compared to the Wadden sea.

Korea does not have any barrier island like the Wadden sea does. Therefore the monsoons have a more direct effect on the tidal flat, because there are hardly any islands that protect it. In the winter there a heavy wind that make strong waves, but in the summer the waves are weaker. This has an effect on the type of sediment that will be deposited. In the summer the tidal flats will be build op with fine mud, but during the winter this will be eroded and the tidal waves will deposit mainly sand then. Therefore the tidal flats in Korea consist of sand, mud and mixes of these two.

Korean tidal flats are more dynamic and have a higher viability than the Wadden sea (Marencic & Enemark, 2011), because in Korea there are rocky coasts and the sediment comes from both rivers and the coast. While the Wadden sea is more or less a lagoon that is surrounded by barrier islands and the sediment mainly comes from the coast.

Another important difference with the Dutch tidal flats is that in Korea there are lots of islands varying from big to very small, which are diffused along the Korean coast. The Korean island have a more open structure than the Wadden sea, which is mainly sheltered by

barrier islands. The Korean islands also have rocky shores whereas in the Netherlands the shores consist of sand.

4.3 Geology

The geological history of tidal flats is important to study. According to Verwei et al. (2010) the current situation and characteristics of the tidal flats are the result of the interaction of processes inside the earth, near and on the surface and in the biosphere, hydrosphere and the atmosphere throughout different timescales. In order to compare the current tidal flats in the Netherlands and Korea it is good to analyse their geological history in brief.

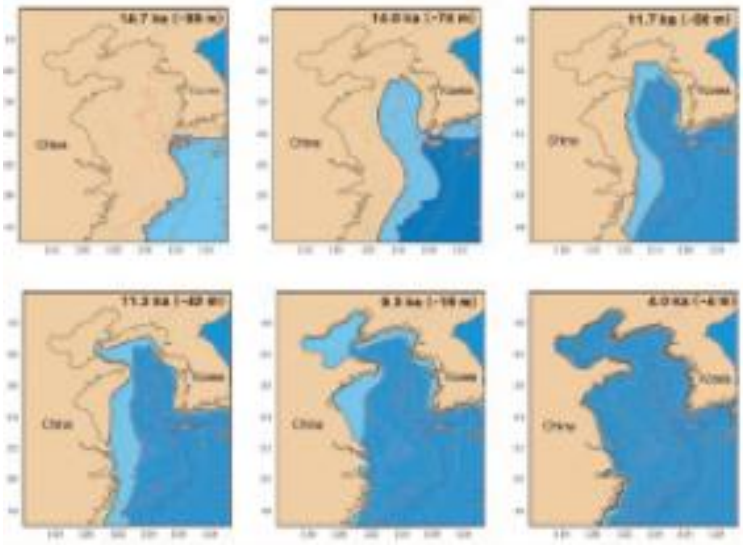
4.3.1 Netherlands

The geological history of the Wadden sea start at least 300 million years ago, because in the surface rocks have been found that are at least this old (Verwei et al., 2010). In the million years until now the Wadden sea has been through a very diverse range of developments that shaped the area until what it is now.
The Wadden sea as it is known today, was formed about 10000 years ago (Verwei et al., 2010). It arose in the Holocene geological time period. This is the youngest time period and it started about 10000 years ago and is still going on. After million years of glacial periods the temperature on the earth increased and made the land ice (which was formed in the glacial periods) melt. Because of this the major rivers turned into big rivers which took lots of sediments with them. More important is that because of the temperature increase the sea level rose about 35 meters. Therefore the water level rose fast and about 5000 years ago the contemporary coastline was formed (Ellenbroek, 2001).
Because of sediments of sand by the sea, the sand dunes along the west and north coast of the Netherlands where formed. The Dutch coast is characterised by a struggle between water and land, this is why the coast is very dynamic. The sea made a lot of gaps in the shoreline and this formed the islands and the Wadden sea as it is know now (Ellenbroek, 2001).

4.3.2 Korea

The geological history of the Korean tidal flats start in the Cretaceous Period. In this period volcanic ash and sediments accumulated in and created the mountains on the Korean peninsula, which make the Korean tidal flats unique.
The Yellow Sea is the sea where the tidal flats can be found nowadays, but the sea did not exist during the glacial periods. The creation of the tidal flats started just like in the Netherlands in the Holocene time period. In this time period the temperature increased, which made the land ice melt and this caused the rise of the sea levels. According to MLTM (2005) the yellow sea was created and expanded because of the rise of the sea level in the period between 15000 and 5000 years ago (see figure 4.1).
Due to this rise of the sea level a lot of sediments was brought up by the tidal currents and waves and formed the tidal flats in these years. The tidal flats were also supplied with sediments from the big inland rivers. According to UNESCO (2010) the creation of the tidal flats in Korea is different compared to the Netherlands. The Wadden sea was created more smoothly, compared to the Korean tidal flats, because the Korean flats are steeper.
According to Marencic & Enemark (2011) the tidal flats of Korea have a higher biodiversity than the Wadden sea. This is because the evolution of species in the pacific has taken place for a longer time, the North sea is relatively new.

Figure 4.1 | The expanding of the Yellow Sea



Source: MLTM (2005)

4.4 Ecology

In the introduction it was said that tidal flats are areas where there can be tension between economy and ecology. In this paragraph a closer look will be taken to the ecological side of tidal flats. In chapter 2 de Groot (1992) said that nature can have several functions, for ecology the regulation and inspirational function of nature are important functions.
Tidal flats are important in an ecological way, because they are areas that have high biological productivity (Hong, 2008). According to Inglis and Rogers (2010) tidal flats are just as important as rainforests and coral reefs regarding their exceptionally diversity of wildlife. Destroying them, would have the same ecological impact. In this paragraph the differences and similarities in ecological terms between the tidal flats in Korea and the Netherlands will be examined.

4.4.1 Netherlands

Benthos:
The bottom of the Wadden sea is full of life, namely cockles, mussels, oysters and other creature that live in the bottom of the Wadden sea can be found in large amounts. These bottom creatures are an important source of food for migratory birds, that use the Wadden sea to rest and feed.

Fish:
The Wadden sea is very important for the reproduction of fish in the North Sea. Because of its shallow environment the Wadden sea is ideal as a nursery area for several species of fish (Berghahn, 1987). But fish use the Wadden sea also for other purposes. Some species live their entire life cycle in the Wadden sea, while other species mainly use it to look for food and some other species use the Wadden sea just to migrate through.

Marine mammals:

Because of the high productivity of the Wadden sea of benthos and other nutrition, this area is suitable for marine mammals. They are in the top of the food chain and therefore dependant of highly nutritious areas. In the Wadden sea there are four types of mammals according to Baptist et al. (2007), namely: Harbour Seals, Grey Seals, Harbour Porpoises and the Bottlenose Dolphins.
The Wadden sea hosts 20 percent of the world's harbour seals. The fact that the Wadden sea is not very deep makes the Wadden sea a unique place for harbour seals. When there is low tide, the seals use sandbanks as a place to rest. The other three species are not large populations in the Wadden sea, but the number is increasing the last decades (Baptist et al., 2007).

Seagrass / halophytes:
When the Zuiderzee was closed by a dyke in 1932, this had consequences for the biodiversity in the Wadden sea. The Wadden sea used to have enormous fields of sea grass (15.000 Ha), but due to a disease this has almost completely disappeared. In some parts is has been restored, but the sea grass never came back in the western part of the Wadden sea (Ellenbroek 2001).

Migratory birds:
The Wadden sea is very important for migratory birds. Each year millions of birds migrate from Siberia, Scandinavia, Greenland and parts of Canada to the warmer areas of Europe and Africa to spend the winter. And each year 6,1 million migratory birds stop in the Wadden sea for a short stay to refuel or to spend the winter there. According to Baptist et al. (2007) the Wadden sea is a very nutritious tidal flat and therefore it can be considered as essential for the existence of all kind of bird species. It is not one out of several stopover sites on the East-Atlantic flyway, it is the essential stopover (Baptist et al., 2007).

4.4.2 Korea

Benthos:
Tidal flats might look quiet in appearance, but it is one of the world's most productive ecosystems. Tidal flats are inhabited by various organisms called benthos. Benthos are organisms that have been fully adapted to the tidal flats. They vary in size, which range from macro benthos (worms, clams, crabs, shrimps, etc.) until micro benthos (unicellar organisms which are not visible with the naked eye, like bacteria). There are over 851 species of benthos in the Korean tidal flats (164 of plants and 687 of animals), therefore the tidal flats of Korea have a high biodiversity when it comes to benthos MLTM (2005). All these different benthos are part of the complex food chain process and when this process stays intact, the ecosystem will remain healthy. Land reclamation forms a threat to the habitat of the benthos.

Seagrass / Halophytes:
In the Korean tidal flats halophytes can be found. In general terms these are plants that grow in areas which are affected by salinity, like tidal flats, estuary and salt marches. Once these type plants have been adapted to these salt circumstances, they don't have to compete with other species. In Korea there are about 30 different types of halophytes. Halophytes seem not that important, but they are in fact. The plants prevent the loss of soil, by holding the

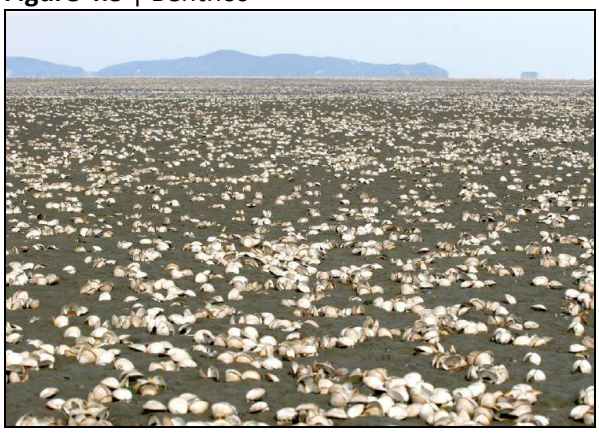
soil together. But they also purify the water streams that go towards the ocean, like a big natural filter.
Nowadays, the halophytes are under threat. Since the Japanese colonial period people started to reclaim pieces of land from the sea and turn this land in into land for agricultural purposes. By doing this they destroyed the halophytes in certain areas, therefore halophytes can now be found only in some areas along the Korean coast.

Migratory water birds:
Just like the Wadden sea, Korean tidal flats function as a stopover along the migratory flyway for birds which travel from Siberia to Australia (UNESCO, 2010). This route (figure 4.2) is called the East Asian Australian Flyway (EAAF) and it is one of the eight flyways in the world. The flyway is more or less an international 'super-highway' for migratory birds (Inglis & Rogers, 2010). The tidal flats of the Yellow sea are one of the most important pit stop along this flyway. Every year about 1 million migratory birds (300 different species) stop here to rest and feed themselves from the nutrition, which can be found in mud and sand of the tidal flats. And another 2 million stop here on the way back to the north (Inglis and Rogers, 2010). This stop is crucial for their survival. If the migratory shore birds are not able to rest and feed themselves, they are likely to die along the route. Land reclamation destroys the habitat of the shorebirds and therefore it becomes more difficult for shorebirds to survive. Some migratory birds in Korean tidal flats are the same species, or sometimes a sibling species of the migratory water birds in the European tidal flats (Kellerman & Koh, 1999).

Figure 4.2 | East Asian Australian Flyway hub

Source: Van der Kam (2008)

Figure 4.3 | Benthos



Source: Birds Korea (2010)

Figure 4.4 | Migratory birds

Source: Birds Korea (2010)

Both the Korean tidal flats and the Wadden sea are important for the migratory birds worldwide. In order to help each other and learn from each other to protect the migratory water birds, Korea and the three Wadden sea countries (Netherlands, Germany and

Denmark) have declared in a statement that they want to cooperate with each other (Marencic & Enemark, 2011).

4.5 Summary

In order to give an overview of the physical differences and similarities between the tidal flats of the Netherlands and Korea, there is a summary in table 4.1.

Table 4.1 | Summary

	Netherlands	Korea
Size	2572,66 km2	2850 km2
Context	Part of the European Wadden sea	Part of the Yellow sea tidal flats
Whole/ fragmented	Whole entity	Fragmented
Type tidal flat	Barrier islands / Lagoon	Open/estuarine/embayed
Islands	Relatively big and made of sand	All sizes and made of rock
Sediments	Sand and mud	Sand and/or mud (depends on the season)
Classification	Micro tidal	Macro tidal
Shore	Smooth and sandy	Steep and rocky
Physical appearance	Lagoon	Surrounded by mountains
Geological time period	Holocene	Holocene
Benthos	Very important	Very important
Fish	Nursery area	Unknown
Marine mammals	Resting area	Unknown
Sea grass	Almost gone	Under threat
Migratory water birds	Important hub	Important hub

Chapter 5: Economic similarities and differences between Korea and the Netherlands

In terms of use, the Korean tidal flat are heavily *used and have a very strong local importance for the tidal flats regions*. (Marencic & Enemark, 2011)

5.1 Introduction

In the previous chapter the geographical, geological and ecological aspects of the Korean tidal flats were examined and were related to the context of the Dutch Wadden sea. But tidal flat areas are more than a geographical entity with rich ecological importance, because tidal flats are areas that also have important economic aspects. In this chapter the focus will be on the differences and similarities between Korea and the Netherlands regarding the use of their tidal flats in economic terms. This will be done by using some economic indicators of the areas. For instance, some important demographic information about the areas will be given, the area will be characterized whether it is a rich area or not compared to the rest of the country and there will be examined what are the most important economic sectors in the tidal flat areas.

5.2 Demography

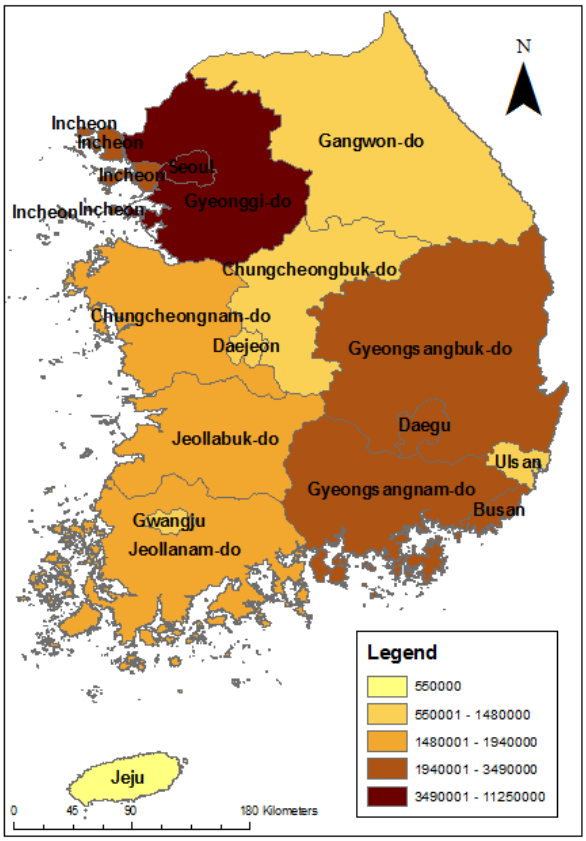
To get a better image of the economic situation in Korea, it is good to know where people are living. In order to know this two measures are used, namely: the total population and the population density.

Korea is has a total population of 48,57 million people (OECD) and is the 26th populous country in the world (CIA Worldfactbook, 2010), but what is most interesting about the Korean population is the spread of the population throughout the country. Almost half of the total Korean population lives in the northwest part of Korea (Seoul, Incheon and Gyeonggi), which are red coloured in map 5.1. The more remote areas are the ones in the southwest (Jeollabuk and Jeollanam), the northeast of Korea (Gangwon) and the island of Jeju.

According to the CIA Worldfactbook (2010) Korea has an urbanization rate of 83 percent. The great share of Korea population lives in urban areas and this can even be seen more clearly in map 5.2. This map shows the population density in the different areas in Korea. The seven metropolitan areas (Busan, Daegu, Incheon, Gwangju, Daejeon, Ulsan and especially Seoul have a high population density. The other areas in Korea are less densely populated, but the differences in density between these areas are not that immense. All the areas have a population density between 150 and 300 people per km2, except for Gangwon (88) and Gyeonggi (1110). Focussing on the research, there can be said that the areas where the tidal flats are in Korea (south- and west coast areas) has a variety in population. While the south and southwest coast are not very populous, this northwest of Korea is probably one of the most populous areas in the world.

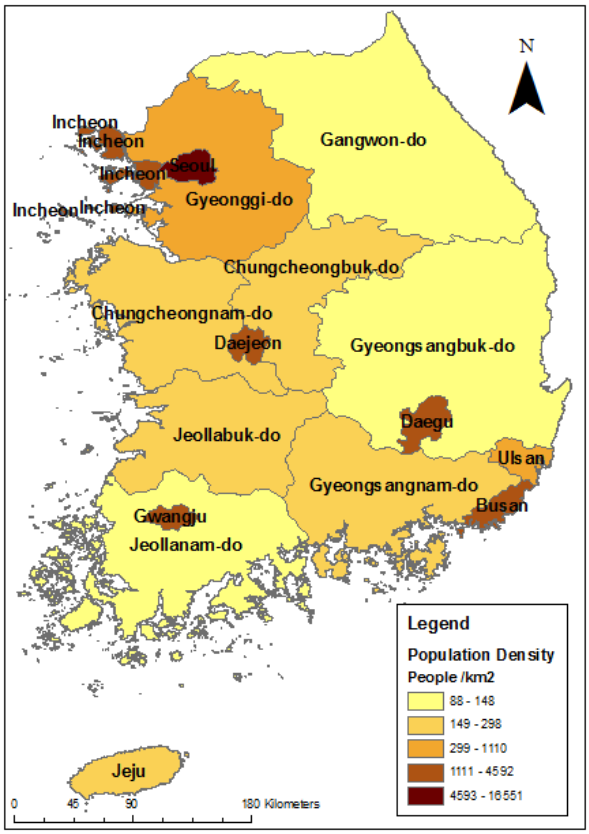
Compared to Wadden sea in the Netherlands, it can be said that the Wadden sea area is also not a very populated area. According to the Central Bureau for Statistics (2009) the population of the Wadden sea area is 257589 people, which is 1,6 percent of the total Dutch population.

Map 5.1 | Total population



Source: OECD (2008)

Map 5.2| Population density



Source: OECD (2007)

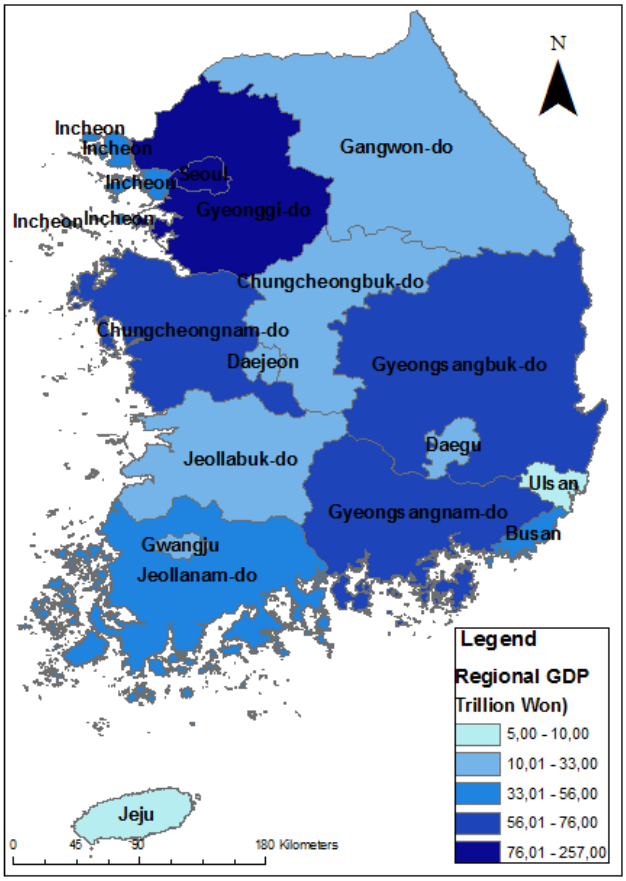
5.3 Economic situation

In the previous paragraph became clear by far the most Koreans live in the metropolitan areas and mainly in the northwest and that the population in the rest of the country is pretty low compared to the core areas. In order to know whether the tidal flats are underdeveloped areas or not, it is important to know something about the economic situation in these areas. For example by looking at the differences in the gross domestic product (GDP) of the different areas. This is a measure for economic production and it refers to the market value of all final goods and services produced within a certain area in a given period (Wikipedia, 2011). In figure 5.3 can be seen that most of the GDP is generated in Seoul and Gyeonggi (northwest). This is not very surprising, since the largest share of the Korean population lives and works in this area.

The image changes when the GPD per capita is calculated. This can be an indicator of the standard of living in a certain area (Wikipedia, 2011). Figure 5.4 shows that the GDP per capita in Korea in not that different in metropolitan areas and rural areas. In the metropolitan Seoul and especially Ulsan the GDP per capita is still quite high, but in some rural areas the GDP per capita is higher than the most metropolitan areas. According to Je (2011) this is because of the good prices for shellfish harvesting.

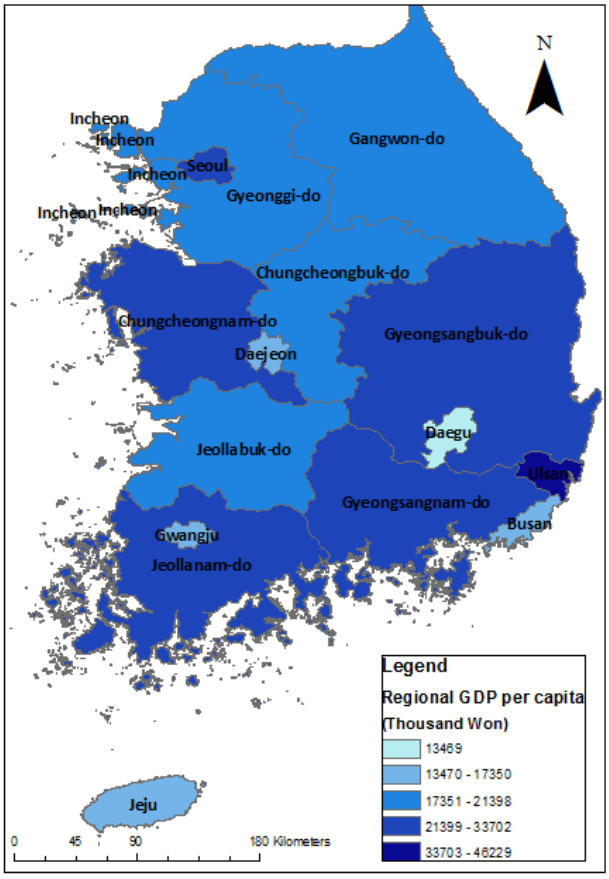
Focussing on the research it can be said that in terms of GDP the tidal flat areas are not that underdeveloped as expected, based on the differences in the distribution of the population throughout Korea.

Map 5.3 | Regional GDP



Source: KOSTAT (2009) Edit by Heslinga (2011

Map 5.4 | Regional GDP per capita



Source: KOSTAT (2009) Edit by Heslinga (2011)

But whether the tidal flat areas are underdeveloped or not is under discussion. Lee (2011) says that the tidal flat areas are underdeveloped in economic terms compared to the rest of Korea and that this area has not developed yet and Kang (2011) says that the west part of Korea is less developed than the east part. Marencic & Enemark (2011) bring a nuance and they says that regional differences matter on a smaller spatial scale. In general terms it can be said that the northwest part the tidal flats is more industrialized and the mid- and southwest are more focussed on agriculture.

Je (2011) thinks that compared to the big cities the tidal flat area in Korea is more poor, but in the coastal region the economic situation is quite good and their incomes are pretty equal, even compared to small cities in the countryside. According to Je (2011) the incomes are pretty good if you live on the west coast, because this area is very good for the shellfish harvesting. At the moment this product is very expensive in Korea and therefore people who have a fishing ground can make more money than an urban labourer in a small city.

Yoo (2011) emphasizes that nowadays it is hard to say whether the tidal flat areas are underdeveloped, because the most tidal flats of Korea are in the western and southern parts of the peninsula and these parts were relatively poor and underdeveloped areas. The Saemangeum reclamation project was initiated in the presidential election as an incentive to develop the area which was deemed to be underdeveloped. But now these areas are becoming rapidly industrialized.

The economic situation of the Wadden sea area is also characterized by regional variation. The Wadden sea area is relatively underdeveloped compared to the rest of the Netherlands, but the economic situation on the islands is better than the mainland for example.

5.4 Changes in the use of the tidal flats

In order to say something about the economic situation it is also important to look at how the tidal flat of Korea are used. The use of the tidal flats is heavily influence by land reclamation projects, which made space for agriculture and industry. Korea has experienced and enormous economic growth in the last two decades and the economic pressure is still very high. This combined with an immense lack of good space (70 percent of the country is mountainous), has resulted in a lot of land reclamation in Korea. A similar situation can be seen in the Netherlands from a couple of decades ago. The embankment scheme in the Netherlands was present until the 1970's, with ambitious plans to reclaim land from the Wadden sea in order to meet the need for space because of industrialization in the period of reconstruction after WWII. Nowadays the economic development in Korea is faster than in the Netherlands (Marencic & Enemark, 2011).

In Korea it is hard to calculated the total size of the tidal flats and also how large the part is that has been reclaimed. The Korean tidal flats consist of two types: the sediment (mud) tidal flats and the salt marches, which are distinguished in the literature. Je (2011) says that 80 percent of the salt marches are already gone, salt marches are usually very easy to develop because it looks like land. Before the larger reclamations after the Korean War the salt marches have already been destroyed.
A problem is that nobody knows how much of the total tidal flat really is lost, because when governments and scientists started to calculate the size, most the salt marches where already demolished. Therefore the actually the number of tidal flats that has been destroyed is higher. It is very hard to find and calculate the size, because every time the government calculated the tidal flat it is different. Nobody knows what is the original size of the tidal flats is, therefore the areas that is lost because of land reclamation is calculated (Je, 2011).
Land reclamation has been part of the Korean culture for decades just like in the Wadden sea area, but according to Koh (2011) the character of the reclamation changed from a traditional, community-led small scale form of reclamation to a reclamation of tidal flats that is state-led, large scale and engineering employed. The amount of reclaimed areas during the twentieth century is a about 2200 km2 and only the reclamation since 1990 is already about 1100 km2.

Table 5.1 | Reclaimed Korean tidal flat areas in different periods

Period:	Area:
1910s-1950s	564 km2
1960s-1980s	550 km2
1990s	800 km2
1999-present	270 km2

Source: Koh (2011)

5.5 Contemporary use of the Korean tidal flats

The previous paragraph made clear that land reclamation has played an important role in the use of the tidal flats in Korea today. In this chapter will be described which sectors are dominant in the tidal flats areas.

5.5.1 Agriculture

The mid- and southwest of Korea is the area that is mostly used for agriculture. According to Kang (2011) agriculture is the biggest sector in the tidal flat area, but the importance of the Korean agriculture is declining. The Korean agriculture is underdeveloped compared to other sectors, this is because the Koreans have mainly focussed on traditional forms of agriculture, like rice paddy fields. Therefore the Koreans would like to change the traditional forms of agriculture of rice paddies into a more value added form of agriculture.
Land reclamation occurred in first instance in the mid- and southwest, because when they reclaimed land from the tidal flats they would have more agricultural land (Kang, 2011). Despite the decline of employment in the agricultural sector in the Netherlands and the Wadden sea area, agriculture still plays an important role in the Wadden area. According to van Dijk and Folmer (2009) 3 percent of the people in this areas are working in the agriculture and fisheries sector, which is above the average in the in the Netherlands (1 percent). Traditionally, agriculture was the most important sector in the Wadden sea area, especially on the mainland.

5.5.2 Fisheries

In the tidal flat areas, fisheries (fish, shells, clams etc.) is an important sector in the Korean economy and culture, which is reflected in the following quote by Baik (2007):

> "For Korean the tidal flats serve an inexhaustible source of food. There are not many countries like Korea having a food culture that savors such marine life as the common octopus, shellfish and sea cucumber. Tidal flat are thus like a warehouse of foodstuff that provides a sustainable livelihood for coastal residents and people in the rest of the country". Source: Baik (2007)

But due to land reclamation projects the fisheries are under threat, because the main fishery grounds for the fishermen are already gone (Yoo, 2011). For example in case of Sihwa lake area the number of fishermen is shrinking. Despite of the recent changes in the area, the main sectors of the areas are fisheries and aquaculture industry according to Yoo (2011). Yoo (2011) also says that these changes have consequences for the local community and their local culture. For example in Sihwa lake they had the tradition of gathering food and sharing, but when their fishing ground was gone also the regional food was gone. This has also consequences for the traditional religions, when fisherman are for example praying to the gods for a good harvest and safety for the fishermen.

Figure 5.1 | Korean Fishermen

Source: Birds Korea (2011)

Figure 5.2 | Traditional fishing methods

Source: Birds Korea (2011)

For losing their fishing grounds due to land reclamation fishermen can get some compensation, but it is not really clear who can actually get compensation an how much that is. Kil (2011) says that landfilling is about creating landmasses in the sea. It is not a matter of compensating them for the loss of land. But if they are actors who lose their live hood (for example fisherman), because of the creation of a landmass, those people will get compensated. According to Koh (2011) it is a process of assessment about who owns what, and who gets what amount of compensation. For example, those who provide the compensation would ask an external company to the damages and the loss of profit for the people who live in that area. Then they will provide a compensation that is in accordance with what has been calculated (Je, 2011).
Fisherman get compensation money, but it is not enough according to Je (2011). It is three times an annual income and in the beginning the local people think that three times the annual income is a lot, but after three years their compensation is gone. After a few years they were thinking different about compensation, because they realized it was not enough. The problem is that they had signed a legally binding agreement and therefore it cannot be changed (Lee, 2011). The government probably did not give enough information according to Lee (2011) and therefore they did not provide a fair story to the fishermen. Another problem is that only the fishermen have who a certain right to fish, are provided with a license fish in that area (Kil, 2011) and the fishermen who are not registered as a fisherman to the government, will get no compensation at all. Because for the official record, they are not seen as fishermen (Lee, 2011).
In the Netherlands there is a connection to fisheries in the Wadden sea area, but the economic interest is not as important to the local culture anymore as in Korea. During the previous century more and more fish was caught and the fishing methods became more massive and destructive (Ellenbroek, 2001). Environmental organizations found that these methods are destructive for the ecosystem and in 2005 it was forbidden to fish for cockles and fishing by bottom trawling (dragging). The focus in the Wadden sea area now is to develop a sustainable way of fishing, for example by creating forms of aquaculture within the dykes (Van Dijk & Folmer, 2009).

5.5.3 Industry

Under the economic growth after the Korean war, Korean started to change from a traditional economy based on agriculture to a more modern economy were industry became more and more important. For example, enormous companies like Daewoo, Hyundai, LG, Samsung, but also smaller companies started to play a major role in the Korean economy. The northwest coast is the area that is close to Seoul and Incheon and this area is considered as a very important area for industry and transportation. For example the Incheon international airport is reclaimed from tidal flat areas and there is some harbour activity. Another big reclaimed land is an area called Song-do and that area is very developed already for industrial activities Kang (2011). According to Je (2011) industry is the most dominant sector in the northwest part of the tidal flats. Je (2011) says that 25-30 percent of the tidal flats is already gone and turned into industrial complex. Another good example is the Ansan area, where the area was reclaimed and a new city and industrial complex was build. There are now more than 7000 factories in this area.
In the Netherlands the industry is clustered in the harbour areas of Den Helder, Harlingen, the Eemshaven and Delfzijl (Van Dijk and Folmer, 2009). Other industrial activities in the Wadden sea area are the AKZO Nobel Chemicals factory in Delfzijl and the recent

establishment of a powerplant in the Eemshaven. Also discussion has been going on about the drilling for gas underneath the Wadden sea, some test drillings have been done (Ellenbroek, 2001) and nowadays there drilling for gas is happening on the island of Ameland.

5.5.4 Recreation and tourism

Next to the traditional use of agriculture and fisheries and the industry in the recent decades, recreation and tourism are relatively new forms of tidal flat use in Korea. Lee (2011) says that in 2008 and 2009 Korea developed a tourism program for the tidal flats, but they had some bad experiences with eco-tourism in the tidal flats, because people took a lot of clams, cockles, etc. from the tidal flats to their homes. In a short period a lot of people went to the tidal flats to experience them, but at the same time people were destroying them. The fishermen knew this because the shellfish stock dropped and they realized something was wrong. Therefore they don't do this kind of tourism on the local scale anymore, because the fishermen were losing income due to that. Because they want the people to have the tidal flats experiences, therefore there are guide tours now. The idea behind this was that people could see and experience the Korean tidal flats, but don't take it home (Lee, 2011).
Despite these problems, eco-tourism in the tidal flats is a quite young form of tidal flat use and according to Marencic & Enemark (2011) eco-tourism is something Koreans would like to develop more in the future. By doing this they can show that tidal flat are more than food and reclamation. Koreans can use their tidal flats for all kind of purposes like the slow-food movement, but also tidal flat walking and sailing. Also information centres can contribute to a better understanding and awareness for tidal flats. Eco-tourism can be used to strengthen the regional identity by for example regional food. Also nature can be used as an economical resource in a sustainable way. Nature can give economic values to the region (Marencic & Enemark, 2011) and in the south Koreans use tidal flats as a unique selling point to get also economic benefit from the tidal flats through slow food and tourism for example.
While in Korea tourism is in its infancy, tourism and recreation in the Netherlands is considered as the most important economic carrier on the Wadden islands. But on the mainland there is no intensive tourism and recreation, except for certain locations (Van Dijk & Folmer, 2009).

5.6 Summary

In this chapter the Wadden sea area in the Netherlands was compared with the tidal flats in Korea by looking at the economic aspects. In general can be said that both areas have similarities regarding the demography of the areas and the economic situation. First, both tidal flats areas are located in relatively low populated areas, except for the northwest of Korea. Second, both areas can in general be seen as underdeveloped areas compared to the rest of the country. But in terms of use the story is a little bit different, namely the Korean tidal flat are heavily used compare to the Wadden sea. Not only are the Korean tidal flats are used for industrial complexes, transportation and other industrial activities, but also they have a very strong local importance for the tidal flats regions. Especially the food that is provided by tidal flats is important for the local and offers employment to small scale enterprises. Also the tidal flats (nature) influence the culture. The tidal flats in Korea are so diverse, that certain types of benthos, clams and fish only appear in certain places. And these different types, require different methods to catch them. This was an eye-opener for Marencic & Enemark (2011) who think that in the Wadden sea area the connection of the

local people with their tidal flats is not that strong as in the Korea. They think that people experience the Wadden sea area mainly through tourism, which is just in its infancy in Korea.

Table 6.1 | Summary of economic comparison

	Wadden sea area (Netherlands)	Tidal flat (Getbol) area (South-Korea)
Total population	Low	Low (except northwest)
Population density	Low	Low (except northwest)
RGDP	Low	Low (except northwest)
RGDP per capita	Low	Quite equal
Land reclamation	Embankment until 1970s	Embankment still going on
Agriculture	Important, despite decline	Important in mid- and southwest
Fisheries	Large scale fishing, dragging, Restrictions	Important & strong local importance
Industry	Harbours, chemicals, gas drilling	Important in the northwest Transportation & Industrial complexes
Tourism & Recreation	Important on the islands Not on the mainland, unlike Germany	In its infancy

Source: Heslinga (2011)

Chapter 6: Social similarities and differences between Korea and the Netherlands

After paying a steep price, in terms of the destruction wrought by the Sihwa Lake and Saemangeum projects, there finally seems to be a proper understanding of the importance of the wetlands and the need to change our previous mind-set (Kim, 2007)

6.1 Introduction

In the previous chapters the physical and economic differences and similarities between Korea and the Netherlands were examined. In this chapter the social differences and similarities between the use of tidal flats in Netherlands and Korea will be investigated. First, it is important to compare the historical context of both countries. It is important to know this, because this historical context can influence the public opinion about tidal flats and land reclamation in the present and future. Second it is good to know what the contemporary public opinion towards tidal flats and reclamation of these areas are. In the introduction it was assumed that the Dutch society is more aware of the ecological values of tidal flats compared to the Koreans. But to what extent is this true, or are there maybe shifts in the attitudes towards tidal flats? Also the role that NGOs play in Korea to raise public awareness will be analysed. Finally, this chapter will be summarized in the last paragraph.

6.2 Historical context

In this paragraph the historical context with regards to land reclamation will be investigated for both Korea and the Netherlands.

6.2.1 Netherlands

There is probably no country in the world that reclaimed more land from the sea than the Netherlands did. About 1/5 of the countries surface (7000 km2) was reclaimed from the sea. The Netherlands have always been struggling with the sea. A large part of the country (40 percent) is under the sea level, and therefore the sea has always been a threat. There was lots of flooding in the highly populated Netherlands. Land reclamation started hundreds of years ago in a very primitive way, but in the 19th century the Dutch started reclaiming land from the Zuiderzee (Southern sea) by making polders in it. Besides the argument that land reclamation and closing the Zuiderzee is crucial for preventing the area from flooding, there is also an economic reason to do this. There was a need for new farmland, therefore large parts of land where reclaimed from the sea. From a historical perspective, the Netherlands has a strong tradition of reclaiming land from the sea.

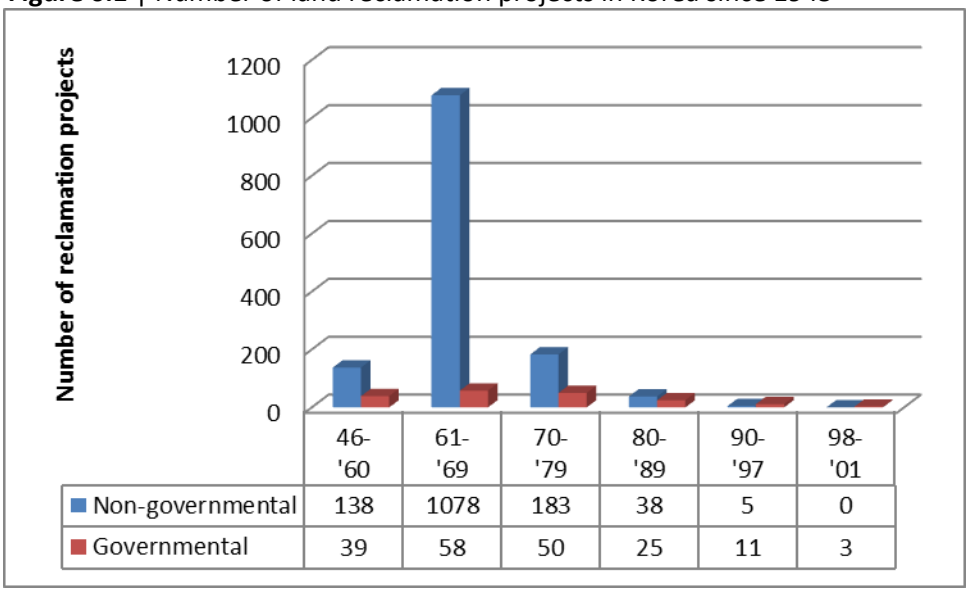
In the past there was hardly any attention for the Wadden sea area as whole in terms of conservation of the area. The most attention by environmentalist and researchers was for the islands and their dunes (Ellenbroek, 2001). The interest for tidal flats became more important in the 1960 (Ellenbroek, 2001). After a flooding disaster in 1953 the Dutch government decided to build enormous engineering works to prevent the Netherlands from flooding in the province of Zeeland. After that, the government also wanted to build similar engineering works in the Wadden sea. This led to the founding of the Association for the preservation of the Wadden sea (Dutch: Vereniging tot behoud van de Waddenzee) in 1966. Because of this and other associations, the politicians became more aware of the values of

the Wadden sea and this finally resulted in an act that has to preserve the Wadden sea in 1980. The recovering and maintenance of the natural values of the Wadden sea became one the objectives of the government (Ellenbroek, 2011). Since the early eighties there was more and more attention for the Wadden sea. Not only environmentalist groups and the politics gave more attention to it, but also other interest groups and the commerce. Where the paradigm before the 1970s was to reclaim land from the sea to create more agricultural land, it now has shifted to a more nature oriented paradigm.
In the most recent years there is a change in the attitude towards the management of nature. According to Ellenbroek (2001) the ideas that nature can manage itself without the interference of man, is used more frequently. In the case the Wadden sea the small islands of Rottumeroog and Rottumerplaat are almost completely left to nature.

6.2.2 Korea

The history of the Korean society and their tidal flats is interwoven. For centuries the Koreans have used the tidal flats as a resource for food and Korean fishermen adapt their daily rhythm to the tidal currents. Also the local community had a local culture with their own traditions of gathering food from the tidal flats and share it with the community (Je, 2011). Land reclamation is not a new phenomenon in Korea. Centuries ago the Koreans started to reclaim land from the sea for mainly agricultural purposes. But during the Goryeo Dynasty (13th century) land reclamation became more important because of political reasons. Land reclamation was now conducted in order to guard the coast against Mongolian invasions.
In the 15 century there was a large increase in population during the Joseon Dynasty, therefore the Koreans started to do land reclamation projects to expand the farmland to prevent the country from food shortages. Until so far, the land reclamation took place on a small scale. This changed under the Japanese imperial rule, where more modern techniques for land reclamation were used. After 30 years, about 56000 hectares of tidal flat land was reclaimed from the sea.
After the Korean War, the Koreans continued to reclaim pieces of tidal flat but again on a small scale. This changed in the 1960s, where Park Chung-Hee (1917-1979) came into power in 1961. Under his rule a period of rapid industrialization started (Choi, 2006)
The combination of a dense population, rooted developmentalism, an authoritarian state with leadership is not conductive for the environment and in this case the tidal flats. In the case of Korea, there was a lack of environmental awareness (Choi, 2006), because the country was under authoritative political rule which was influenced by an enormous economic growth and therefore nature was not considered as important.
That the focus to economic growth is more important than preserving tidal flat in the 60s becomes clear in figure 6.1, which shows that the number of land reclamation projects was very high in the 1960s. But figure 6.1 also shows that the number of land reclamation project was becoming less and less every decade. Therefore the number of projects has been decreasing since the 1960s, but figure 6.2 shows that in fact the size of those projects is increasing. Korea has a long tradition in land reclamation, but there was a change from small scale reclamation to large scale projects (Koh, 2011). Unfortunately, there is no data after 2001 in figure 6.1 and 6.2, but land reclamation will still continue, but in smaller projects. Also striking is that non-governmental development have been dominant, but since 1998 there were no land reclamation project, according to figure 6.1 and 6.2.

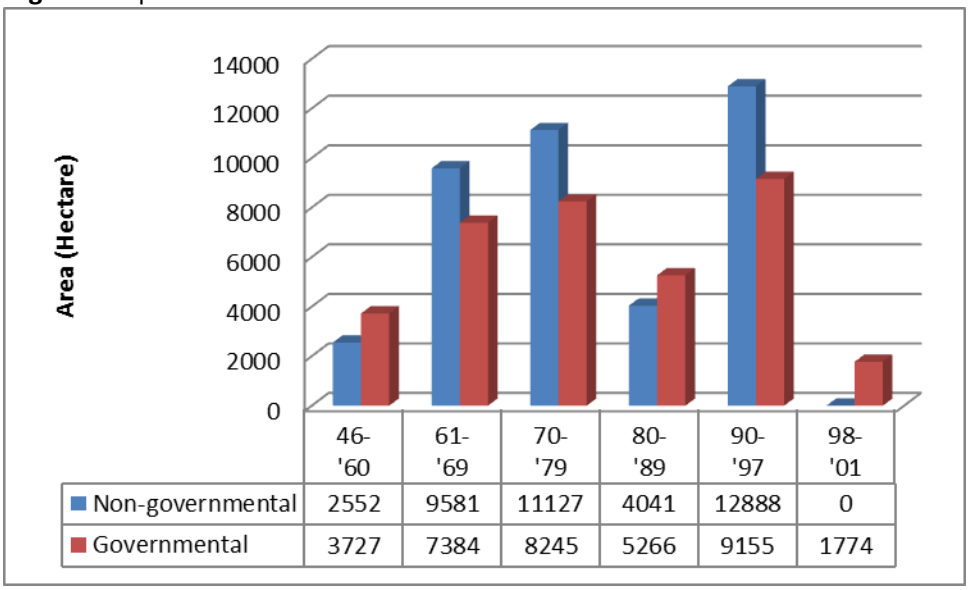
Figure 6.1 | Number of land reclamation projects in Korea since 1945



	46-'60	61-'69	70-'79	80-'89	90-'97	98-'01
Non-governmental	138	1078	183	38	5	0
Governmental	39	58	50	25	11	3

Source: Choi (2006) Edited by Heslinga (2011)

Figure 6.2 | Total area of reclaimed land in Korea since 1945



	46-'60	61-'69	70-'79	80-'89	90-'97	98-'01
Non-governmental	2552	9581	11127	4041	12888	0
Governmental	3727	7384	8245	5266	9155	1774

Source: Choi (2006) Edited by Heslinga (2011)

6.3 The first emerge of environmental awareness

In the past paragraph the historical context regarding tidal flats and land reclamation was described for both countries. In this paragraph it will be investigated what kind of change in the Korean mind set took place and how the Korean think about tidal flats nowadays. The focus will be on the Korean situation and this will related to a Dutch context.

In the 1980s the first environmental movements emerged in Korea. During decades under a strict regimes this was not normal for Koreans, but because of political transitions (democratization process) and environmental degradation due to spatial unequal development, the first environmental movements appeared in the 1980s (Choi, 2006). The first environmental movements in Korea can be characterized anti-pollution and anti-nuclear and after first environmental movement was found in 1982 (Korea Pollution Research

Institute) the amount of environmental movements in Korea expanded both quantitative and qualitative terms.
Despite the democratization process and the spread of environmental movements, nobody was really concerned with the conservation of tidal mudflats and salt marches. This is because mudflats and salt marches were not seen as a precious environment yet by Koreans (Choi, 2006). Je (2011) says that before the 1990s the awareness of tidal flats under ordinary people was very small, for them a tidal flat was just a flat. Ordinary people who only live in urban areas don't understand the values of a tidal and also people who live in coastal cities have never really experienced tidal flats. Only the fishermen who working at tidal flats, scientist and some NGO activist understood it then. In Korea there was no controversy to the public about land reclamation and according to Kang (2011) it was a matter of building a dyke around a pieces of tidal flat, reclaimed it and there was no debate about it. Koreans dominantly regarded the land reclamation projects as economically beneficial zones which could enlarge the farm land and make huge industrial zones. (Yoo, 2011)
In the recent decades the public opinion towards the importance of tidal flats has changed according to Kim (2007). In the 1980s there was a rise of environmental movements in Korea, but in the 1990s (since the Olympics Games in 1988 according to Kang (2011) people started thinking more about environmental issues and there was more public awareness for tidal flats in Korea. This was caused in part by some important events in the 1990s, namely:

- Rio summit (1992)
- Sihwa project failure (1994)
- Saemangeum project controversy (1998)

6.3.1 Rio summit

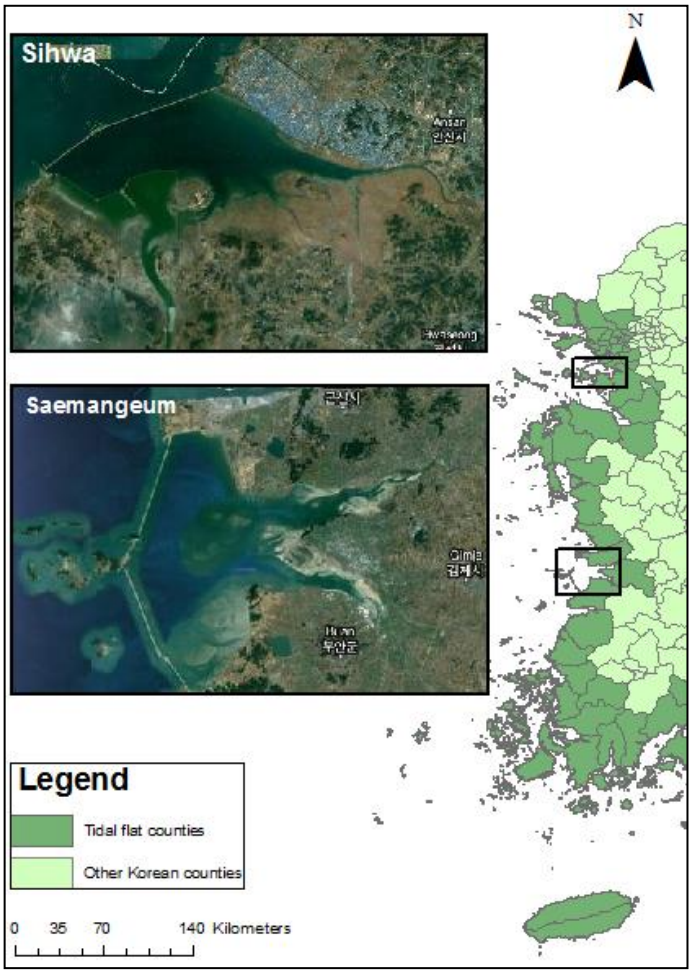
An important event in the shift from development to conservation of tidal flats in the 1990s was the Rio Conference in 1992. This conference played a critical role in broadening Korea's environmental movements not only in terms of their concerns but also in terms of the emergence of the cooperation between environmental groups and the business sector (Choi, 2006). In that time NGOs became even more interested in wetlands and their values and also local NGOs and scientist tried to create more awareness under the Korean people (Je, 2011).

6.3.2 Sihwa failure

The first resistance against large scale reclamation projects was caused by the Sihwa lake project in 1994 (Kang, 2011). This is a reservoir that is 56,5 km2 big and it was created by a 12,3 kilometre long dam cutting it off from the sea (Lee et al., 2002). It is located between the cities around Seoul, namely: Ansan, Siheung and Hwaseong (see map 6.1). The project started in 1987 and the main purposes of the project was to create an area that was suitable for rice paddy field and therefore a fresh water lake (lake Sihwa) was created to have a water supply for the agricultural areas. Immediately after the building of the dam the hydrology of the lake changed, and this caused a decrease in the water quality of the lake. The lake namely functioned as a wastewater storage for the rivers and creeks from the city of Ansan and the industrial complex. Environmentalist were worried (Kang, 2011) and argued that the bottom of the lake was heavily polluted and that there was hardly any life in the bottom of the lake.

Because of this, the lake was not suitable for agricultural water supply anymore. Eventually the Korean Water Resource Cooperation (KWRC) released the waste water into the sea on 29 and 30 June 1996, despite strong opposition of environmental movements (Choi, 2006). The failure of lake Sihwa raised awareness among the Korean public about land reclamation and man-made lakes and formed a warning for all the upcoming projects (Kang, 2011). Also more research institutes, environmental groups were founded and demonstrations were going on (Koh, 2011).

Map 6.1 | Sihwa & Saemangeum



Source: Google Maps (2011) Edited by Heslinga in GIS (2011)

6.3.2 Saemangeum project controversy

After the failure of the Sihwa project, the public resistance against land reclamation intensified, when the government announced another major land reclamation project called the Saemangeum project and formed a catalyst in sustainable development in Korea (Choi, 2006)
The Saemangeum project is land reclamation project in the southwest of Korea, which was started by the Korean government in 1991. The original aim of the project was mainly to create more farmland. But due to an oversupply of rice and the shrinking agricultural sector, the government eventually decreased the ratio of farmland in the project to only 30 percent. With the size of 40.000 Ha (equal to the size of 80.000 football fields), this project is one of the biggest land reclamation projects that ever took place in Korea. The size of the Saemangeum project is slightly smaller than the 'Noordoostpolder' in the Netherlands, which is 46.000 Ha in size.

Figure 6.3 | Landfilling by KRCC

Source: Heslinga (2011)

Figure 6.4 | Abandoned fishery (Saemangeum)

Source: Heslinga (2011)

The literal meaning of Saemangeum is (sae = new) and (mangeum = an immense sum of money). Thus it means 'a new land that promises to produce and immense sum of money' (Choi, 2006). This name reflects the traditional Korean attitude towards this area.

6.4 Public resistance /awareness nowadays

In the 1990s there was a growing public awareness of the values of tidal flats and there has been resistance against large scale reclamation projects. According to Koh (2011) a survey a couple of years ago has shown that about 70 percent of the Korean population was against land reclamation projects in general, but this was during the Saemangeum campaign and therefore quite high. But is this still the case?
Koh (2011) and Je (2011) think that the public awareness regarding tidal flats was became lower than before and they estimate that about 50 percent of the population is against land reclamation in tidal flat areas and think that conservation is more important than development. If you really want to do something 50 percent of the population is not enough, and according to Kang (2011) you need to have a larger majority of people who think conservation is more important, like in the Netherlands for example. Eventually it is not relevant what share of the population thinks conservation is more important or not. The most important thing is to have a strong 'passionate minority', for example NGOs, which have a leading role in making the large majority aware of environmental issues.
Kang (2011) also makes a distinction between land reclamation in general and the land reclamation in Saemangeum. The Saemangeum environmentalist where very much against finalizing the dyke, but people in general now think that it should be finalized, because it already started. The dyke has been made and now they think it should be finalized, because stopping it would be a waste of money, since large investments have already been made. Kang (2011) even says that the progressive part of the government sometimes is in favour of finalizing the project.

Figure 6.5 | Different actions of public resistance against the Saemangeum reclamation

Sources: KFEM (2000), Birds Korea (2008) & Conklin (2006)

Koh (2011) also thinks that nowadays people don't have much interest in land reclamation or development, because a lot of people are tired of demonstrating against large scale reclamation projects. They had the impression that the government had increased public awareness, but eventually it had no practical acceptances. For example the Saemangeum is going on, and also other reclamation projects have been planned. Koh (2011) thinks it is not easy and sometimes hopeless to do something about reclamation, regarding the following quote:

"You can write some essays in the newspaper or media. Or you can have a protest as an activist. You can speak about it with friend, but nobody would hear you probably. So, if the government does not hear you (or does not want to hear you), it is hard to do something against it.". Source: Koh (2011)

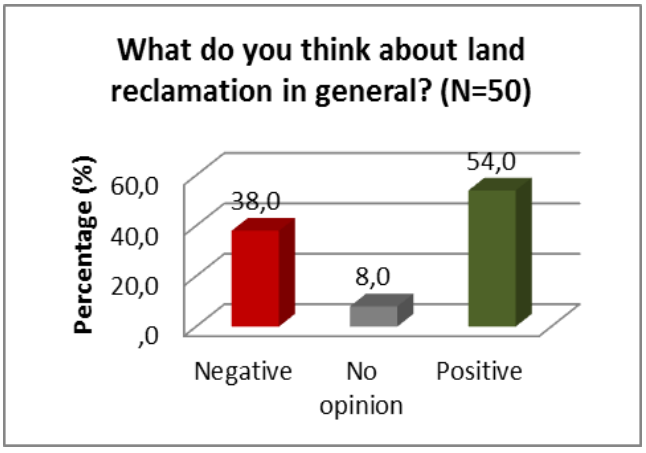
Marencic & Enemark (2011) think that the resistance against land reclamation depends on the region. For example, the southwest of Korea is an area that is economically underdeveloped compared to the rest of the country. This is partly because the area consists of islands and they are therefore not so well connected to each other and hard to access compared to other areas. Despite this, the southwest is proud of their tidal flats and they want them to stay natural. Lee (2011) thinks that people from rural areas are more conscious about environmental conservation, because it is common for them how to utilize their natural resources for the benefits of their own people. The north, on the other hand, is highly industrialized compared to the southwest. Most people in this area see development as a good thing and they are proud of the engineering projects they have achieved.
In the Netherlands the opposite seem to be true, where the farmers from the rural areas were in favour of reclaiming tidal flats in the 1970s and the people from the cities wanted to preserve the Wadden sea. While in Korea the people from the rural/local rural areas are proud of the tidal flats and the government is Seoul has plans to reclaim them.

The media played an important role in the 1990s in order to get public awareness for the tidal flats in Korea. Kang (2011) says that nowadays there are a lot of documentaries on TV in Korea about tidal flats. It is about the effects for the environment, nature and biodiversity. The documentaries say that if we destroy the tidal flats, the whole ecology will be destroyed. From the year 2000 there are a lot of environmental related issues in the news and on TV. Public awareness goes through media, because when Koreans see the importance, benefits and environmental impacts of the tidal flats and then they would understand the natural values of tidal flats.

6.5 Public opinion and awareness

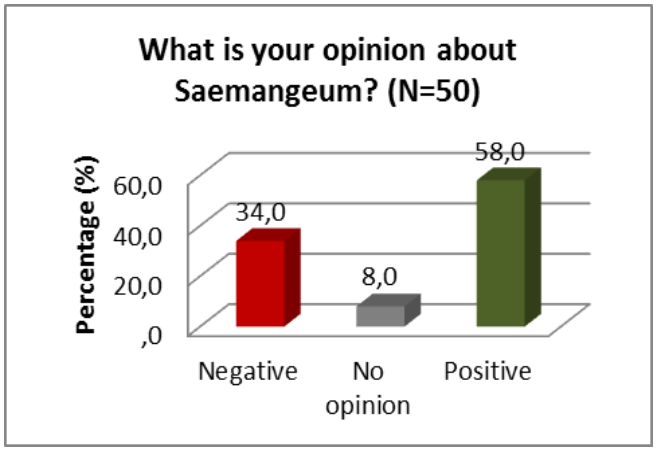
In order to get a better understanding of what Koreans think about tidal flats and land reclamation a small survey was conducted under 50 Korean which were selected randomly. First, the respondents was asked what their opinion is about land reclamation in general and a large part (54 percent) thinks that is it something positive, while 38 percent of the respondents sees land reclamation as something that is negative (figure 6.6). The next question that was asked was what the respondents opinion is about the Saemangeum project. The results in figure 6.7 are almost the same as the question about land reclamation, only even more people see Saemangeum as something positive (68 percent).

Figure 6.6 | Opinions about land reclamation



Source: Heslinga (2011)

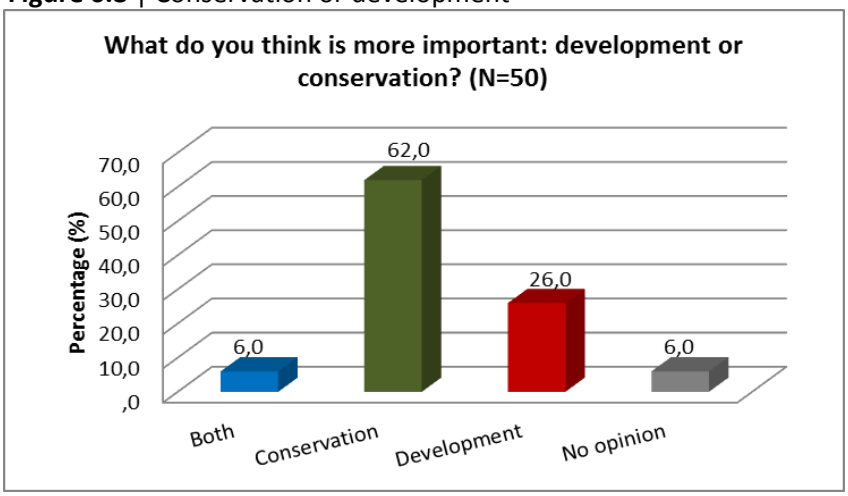
Figure 6.7 | Opinions about Saemangeum



Source: Heslinga (2011)

Based on this survey it looks like the majority of the respondents think that land reclamation and especially the Saemangeum project is seen as something positive. But the third question changes this conclusion. The respondents was asked what is more important to them: development or conservation of the tidal flats. Surprisingly, figure 6.8 shows that 62 percent of the respondents thinks that conservation is more important and only 26 percent favour development of the tidal flats. Also, 6 percent thinks that conservation and development can go hand in hand and think that they are both important.

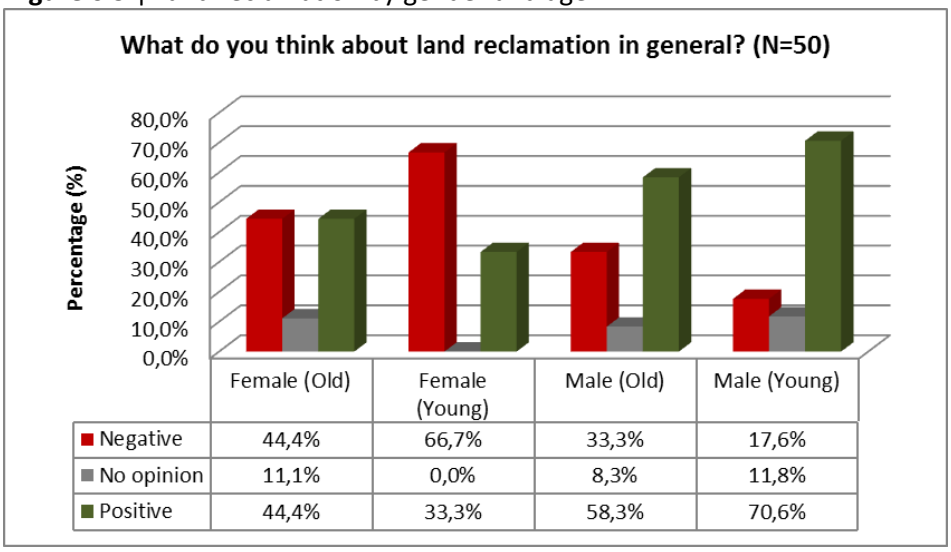
Figure 6.8 | Conservation or development



Source: Heslinga (2011)

Je (2011) says that gender and age matter in peoples attitude towards tidal flats. For example the people who think conservation is more important are in general female, young and highly educated and people who prefer development are generally older men who work in business. When the results of the survey are being split into gender and age, becomes clear that Je (2011) is more or less right based on this survey. In figure 6.9 can be seen that women have a more negative attitude towards land reclamation than men. Based on this survey there can also be said young people are very divided, namely 66,7 percent of the young female think that land reclamation is negative, while 70,6 percent of the young male think that land reclamation is something positive. In figure 6.10 the opinions about the Saemangeum project are shown and similar patters can be seen as was described above.

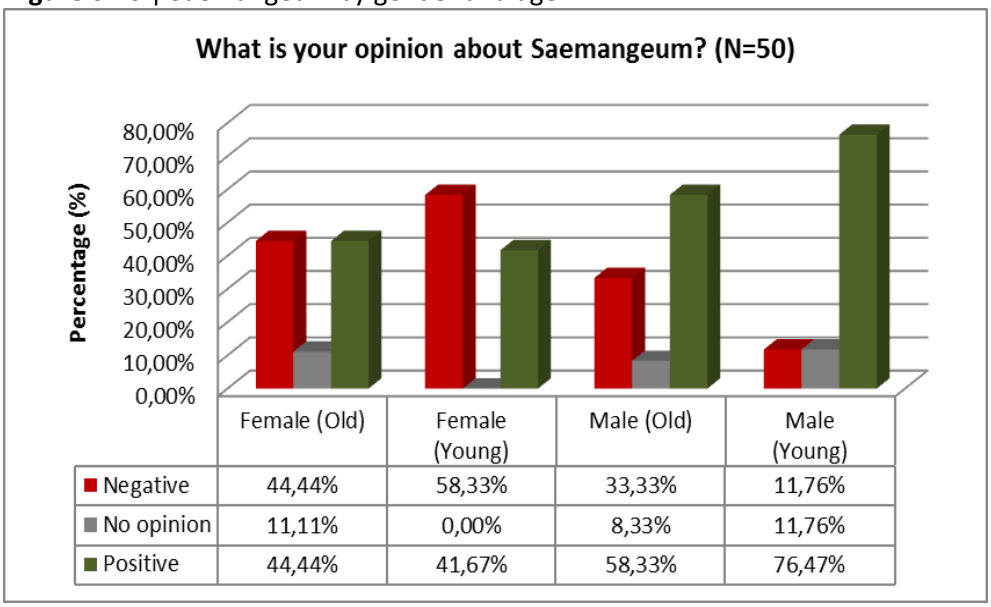
Figure 6.9 | Land reclamation by gender and age



	Female (Old)	Female (Young)	Male (Old)	Male (Young)
Negative	44,4%	66,7%	33,3%	17,6%
No opinion	11,1%	0,0%	8,3%	11,8%
Positive	44,4%	33,3%	58,3%	70,6%

Source: Heslinga (2011)

Figure 6.10 | Saemangeum by gender and age

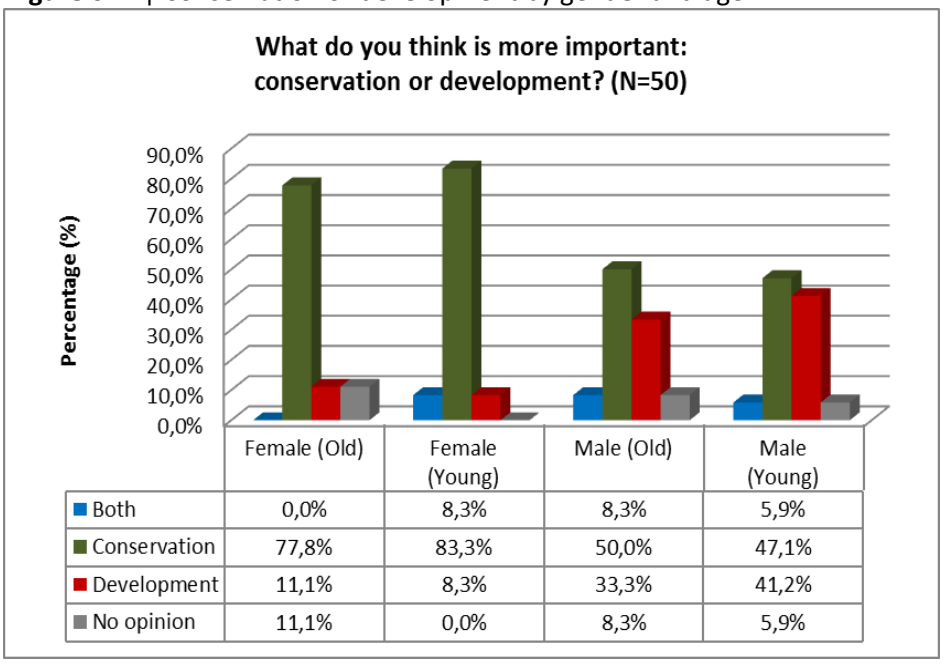


	Female (Old)	Female (Young)	Male (Old)	Male (Young)
Negative	44,44%	58,33%	33,33%	11,76%
No opinion	11,11%	0,00%	8,33%	11,76%
Positive	44,44%	41,67%	58,33%	76,47%

Source: Heslinga (2011)

Finally, in figure 6.11 the results can be seen of what is most important to Koreans: conservation or development. Based on this survey it can be said that a large share of the women think conservation of the tidal flats is important (young: 83,3 percent and old: 77,8 percent). For most of the men conservation is more important than development, but men (both old and young men) are more divided about this than women.

Figure 6.11| Conservation or development by gender and age



	Female (Old)	Female (Young)	Male (Old)	Male (Young)
Both	0,0%	8,3%	8,3%	5,9%
Conservation	77,8%	83,3%	50,0%	47,1%
Development	11,1%	8,3%	33,3%	41,2%
No opinion	11,1%	0,0%	8,3%	5,9%

Source: Heslinga (2011)

6.6 Non-governmental organizations: (NGOs)

Box 6.1 | List of environmental NGOs related to tidal flats.

- Birds Korea
- Korean Federation for Environmental Movement (KFEM)
- Green Korea United
- Wetlands Alliance
- Getbol Forum
- East-Asian & Australian Flyway
- Korean Wetland Society

NGOs can play a crucial role in creating public awareness and resist large scale reclamation projects in order to protect the tidal flats. Je (2011) says that this is a hard thing to do for NGOs in Korea. In the previous paragraph became clear that Koreans are still divided about this subject. For NGOs it is quite simple to convince the one half, but very hard to convince the other half.
First, it is good to mention that Korea is still a relatively young democracy. For centuries they have been under rule of the Chinese and Japanese powers and after the Korean War Korea was under a very strict regime (Marencic & Enemark, 2011). Now that a democratization process has taken place, people and NGOs should now be more able to speak up, but for Koreans this is all quite new.
Despites the previous there are some reasons why the NGOs in Korea could do a better job, which will be explained below, but can be summarized in the following quote by Kang (2011):

"Korean people are becoming more aware, but they don't have organizational, political or financial power. They think that the tidal flats are important, but they do not know how to be against politics and they think it is critical to demonstrate." Source: Kang (2011)

6.6.1 Organizational power

First of all, the NGOs in Korea have no systematic organizational power and therefore it is just demonstrating on a small scale. For example the Saemangeum project started in 1971 but the first real demonstrations occurred almost when the dykes where completed (Kang, 2011). They already fought a lot against the government, but they are very small and do not

give much opposition, therefore they are focussing on small projects now (Kang, 2011). Marencic and Enemark (2011) say that there is a competition in Korea between different stakeholders. There are NGOs who gather all kind of data about tidal flats, but they don't share the information with other NGOs in Korea.

6.6.2 Political power

Second, in Korea scientists, NGOs and politicians are not very interwoven with each other compared to the Netherlands and Germany according to Marenic & Enemark (2011). In their eyes a scientist can also be a politician for example and this makes it easier to get political influence and support in order to create public awareness for environmental issues.

6.6.3 Financial power

Third, Koreans know that it is important to protect their tidal flats, but the NGOs in Korea do not have a strong financial power in other to actually do something. In the Netherlands there are a lot of NGOs and their position is quite strong and they collect the money to do something against the problem (Kang, 2011) and without financial support and power it is just protesting (Koh, 2011). While in the Netherlands, NGOs have the financial power to follow legal procedures and eventually bring a case to the court.

6.7 Advise:

In order to get more public awareness and a stronger position for environment NGOs something has to be done. Marencic & Enemark (2011) say Korea needs technical arguments to convince the people that tidal flats are important. When people talk about tidal flats in terms of their aesthetic beauty or their importance, it is hard to convince Koreans, because these aspects are not really clear and tangible. The process for people to become aware of nature conservation is a long one.

Also Korean tidal flats are not seen as a whole and not just in geographical terms where it is more of a mosaic of different sized tidal flats, but also in the mind of the people it is hard to establish an image of the Korean tidal flat as a whole. This needs to change and education can be helpful with that, for example there are now some activities with local fishermen and local people (Je, 2011).

Lee (2011) says that there are educational centres in the local areas where people can learn about tidal flats. Also, some schools are lucky, because these are specialized schools where the ministry of environment and the ministry of maritime affairs promote environmentalism. And these school are the first to go to for these kind of things. In 2009 the ministry of environment also announced a big national plan, called the 'Five year national plan to promote environmental education'. Education can help, but Je (2011) emphasizes that it is hard to change the mind and that it is also a matter of time.

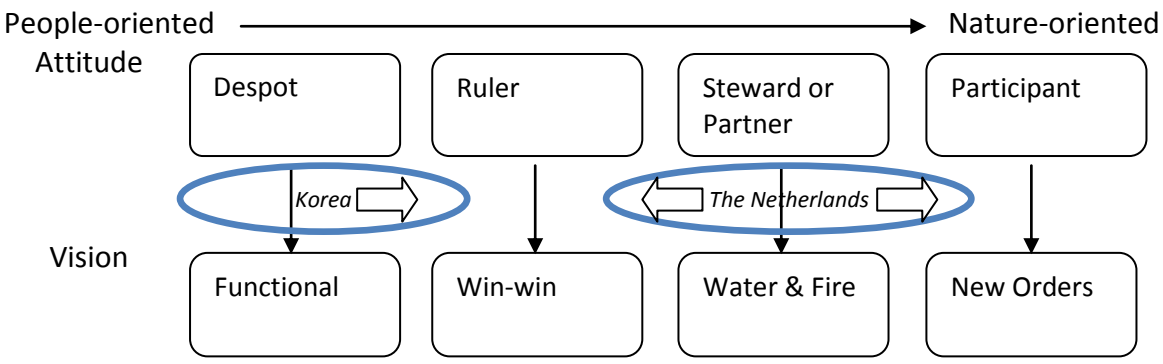
Koh (2011) says that last year the international Wadden sea school was founded by the Trilateral Cooperation and has the goal to create awareness for the Wadden sea under children. People from the Wadden sea school came to Korea to create some forum for demonstration to teach the children and the general public.

6.8 Summary

Both Korea and the Netherlands have a strong historical tradition in land reclamation. In Korea there has been a lot of small scale reclamation going on in the twentieth century, because Korea has a lack of agricultural farm land due to mountains. Economic growth in the

1960s and 1970s led to an even bigger demand for land and this led to the enlargement of the scale of land reclamation in Korea. In the Netherlands land reclamation was also conducted under economic pressure, but the difference is that it was also needed for protection of their coastline.
In the Netherlands the attitude toward changed since the 1970 when policy was conducted for protection of the Wadden sea and made the Wadden sea important. Not only environmentalist groups and the politics gave more attention to it, but also other interest groups and the commerce. In Korea the first environmental awareness was in the 1980s and the public awareness is still developing.
Important events that led to a rise in awareness of the Korean people were the Rio summit (1992), the Sihwa failure and the Saemangeum controversy. NGOs then managed to get public attention by demonstrating and using the media. During the Saemangeum campaign most of the population was against land reclamation in tidal flats areas, but now this is about fifty-fifty. Koreans are still divided about the subject of land reclamation, because in some areas people think reclamation is important, while people in other areas see the natural values of tidal flats. Based on this research's survey and statements of Je (2011) also a gender and age difference can be seen in the attitude towards tidal flats conservation, but in general there are more and more people who think that conservation is more important than development of the tidal flats. Despite this, the position of the Korean NGOs is not quite as strong as in the Netherlands, because they lack of a good organizational structure, political influence and financial funding. To improve the public awareness in Korea, NGOs have to become stronger and convince the public with technical strong arguments that tidal flats are important. Also there is a very important role for education, in order to achieve that people are becoming more aware of the values of tidal flats.
In the theoretical chapter of this research Blom & van Soest (2003) explained that there can be different attitudes and visions towards nature an economy, ranging from people oriented to nature oriented. Based on this research can be said that in Korea the vision of the people towards nature has been mainly functional, but there has been a small shift to a vision where man is more of a ruler over nature and there is a win-win situation between nature and economy. After a long tradition of a functional vision in the Netherlands on the Wadden sea, the attitude is more nature oriented then in Korea and for a long time the vision was that nature and economy are as water and fire. But now in the Netherlands some areas are left over to the nature on the one hand, but on the other hand there are also economic activities going on in the Wadden sea.

Figure 6.12 | Shifts in visions on nature and economy in Korea and the Netherlands



Source: Blom & Soest (2003) Edited by Heslinga (2011

Chapter 7: Political similarities and differences between Korea and the Netherlands

"Environmental management measures for Korea's coastal areas must acknowledge development pressures and seek to balance these pressures against the goal of preserving their unique ecological qualities. To date many laws governing conservation have not achieved that balance but have favoured rapid economic growth." Source: Hong et al. (2008)

7.1 Introduction

The first chapters of the research were about the physical, economic and social aspects regarding the use of tidal flats in Korea and the Netherlands. This chapter is looking for the differences between these two countries in political terms. This chapter is probably the most interesting and complex chapter of this research, because the political situation in Korea is quite difficult to understand (Koh, 2011).
In order to understand how the management of tidal flats in Korea works, it is necessary to get a clear understanding of how the political system in Korea works. This is a helpful tool for getting a closer look in how the process for land reclamation is created and how national laws and agreements for protection of tidal flats are created and observed. Finally, will be examined in what kind of international treaties about wetlands Korea is involved and what the actual meaning of these treaties are.

7.2 Korea's political system

In order to get an overview of the management of the tidal flats in Korea works it is important to know who the different actors and stakeholder are in the political arena and how the area related to each other. In the paragraph below some stakeholders will be explained and in eventually all these stakeholders will be shown visually in box 7.1. Before this it is good to notice that Korea is a country with a hierarchic tradition and also is the decision making (Koh, 2011). Besides that it is also good to realize that Korea is still a young democracy and that this process of change takes time (Marencic & Enemark, 2011). Choi (2006) even said that the real completion of the democratization process was achieved only in 1992 with the election of Kim Young-Sam as president.

7.2.1 President

Korea is a republic and therefore has a president. In Korea the president is, like in many countries, the most important political person in the country. According to Je (2011) the governments national policy towards nature depends on what the president and his party are thinking. At the moment the ruling party is the Grand Nation Party, which can be characterized as conservative and on the right wing of the political spectrum and the president is Lee Myung-Bak since 25 February 2008 (Je, 2011).

7.2.2 National government

The national government is the most important institution in Korea. What kind of policy towards nature the national government has, depends on the political party that is power. Kang (2011) emphasizes that a geographical distinction can be made between conservative and progressive voters. People from the west are always supporting a progressive government and eastern people are always supporting a conservative government. In Korea there have been many governments since 1950 (Korean War), but only ten years the

progressive party was in power and the rest of the time the power was in the hands of the conservative party.
In the 1970s and 1980s Korea was developing very fast under the rule of the conservative party. In that period a lot of shipbuilding, industrialization, etc. was established in the eastern area around the city of Busan and not in the western part of Korea. This is because a lot of important politicians and even presidents came from that same area. Many people of the Grand National Party came from this area, therefore it is not a coincidence that in this particular area a lot of development took place (Kang, 2011).
For many decades, the main strategy of the national government has been economic development, but since the 1980s the voice of environmental movements has become stronger and therefore the government has to adapt to these development. In 1998 the government established a national legislation on biodiversity and in that document the government officially announced that they want to protect natural resources and natural property (Je, 2011). The government also changed the original plan for Saemangeum for example. In the beginning it was a project suitable only for agriculture, but during the years they changed it to a more multi-functional project with more residential areas and industrial complexes.
Again, decision like this depends on the attitude of the government that is in power. The previous example of adapting the Saemangeum project was made possible under the rule of a more progressive government, while the contemporary government made Saemangeum project one of the central government main priorities. This government is a very conservative one, but before this there was period of fifteen years when Korea had a more progressive government, which is hearing the environmentalist voice more (Kang, 2011).
The strategy of the Korean government nowadays, is called 'Green Growth' and this means that the government wants to achieve two goals in the same time. They want natural conservation and economic growth at one time (Kang, 2011). Lee (2011) says that it is quite difficult for the government to develop the country even more economically and also to have this growing need to achieve natural goals at the same time. Therefore Lee (2011) thinks that Korea has still a long way to go.
Koh (2011) has the impression that the government wants to have a green image and he assumes that this kind of strategy is for a symbolic attitude and looks like a 'bubble' to him. They government would never admit that, but a strategy like Green Growth have nothing to do with natural values, it is about politics (Koh, 2011). Marencic and & Enemark (2011) also emphasize that Green Growth strategies are more focussed on the environments and waste etc. and that they are not really focussed specifically on tidal flats.
It is not very obvious what the most important issue for the national government is: economic growth or the protection of the tidal flats. Yoo (2011) thinks that the government is trying to keep a balance between the two. Kang (2011) says that is in between, but that it is constantly changing. Because of the fact that the government has on always been on the hand of development (Kang (2011) thinks the most important issue for the Korean government is still development, but every day that also say that the tidal flats are important. Despite the large share of ordinary people who believe in protection of the tidal flats, the government is still struggling. Politicians and developers are pushing the government to that more development is needed. According to Je (2011) the problem is that the government does not understand the influence of ordinary people, but only understands the knowledge of developers, who are mainly thinking in terms of numbers. Therefore the government does not fully understand the importance of tidal flats or

wetlands. The government says that they fully understand, but they act quite different. (Je, 20110)
The basic problem is that Korea does not have any marine spatial planning (Koh, 2011). Ideally, the whole area must be planned carefully in an integrated way, but any form of classification or hierarchy in tidal flat areas does not exist in Korea. Therefore all the tidal flat areas are the same and everything can happen and nothing is safe for the government and their plans. (Koh, 2011)

7.2.3 Ministries

In the previous paragraph is became clear that the Korean government consist out of two parts. For the one part, their job is the conservation and for the other part development is their main concern (Koh, 2011). This dichotomy described above can also be seen in the Ministry of Land, Transportation and Maritime Affairs (MLTM), which is responsible for tidal flats and reclamation. This ministry is very large, because it is an integration of the maritime ministry and the construction and transport ministry. Within this ministry there are some departments that are more development oriented, whereas other departments are more conservation oriented. And there are also external ministries which are significantly more conservation oriented (Kil, 2011). For example the ministry of Environment (MOE) and the ministry of Food, Agriculture, Forestry and Fisheries (MIFAFF)
It is a complicated situation that within one ministry, there are two departments of which one is on the development side and other on the conservation and preservation side. Which department is more dominant, depends on the political power according to (Koh, 2011). Je (2011) thinks that the department for the construction of land is much stronger.
Finally, Koh (2011) says that in Korea there are a lot of different ministries with different visions making different plans for tidal flats. For a better management tidal flats they should cooperate more, instead of doing their own research for their particular interests and do not share this information.

7.2.4 Local governments

Not only the national government and their ministries make policies for the use and management of tidal flats, also policy is made on the local level of the provinces and municipalities. According to Koh (2011) and Kil (2011) local governments have their own voice in making plans for the policy, but it is very complicated. This is because on the local level they are different opinions of what to do with their tidal flats, namely some counties wish to protect and others wish to develop their tidal flats. For example, some counties wish to introduce large industry and therefore those counties need land and space (Koh, 2011). According to Choi (2006) these regional differences are the result of the local self-governance. Elections on the local level governments created regional rivalries, which are one of the unique characteristics of Korean politics.
Korea is still a country with an hierarchic system and the local government does not have the power to make decisions on their own. The central government is always making the final decision. But sometimes it is very complex, because of the different political parties and therefore different opinions (Kang, 2011). Local government have to ask the central government and the ministry. The central ministry has once a year some kind of decision making meeting and in this meeting they decide which areas should be allowed to be reclaimed or not (Koh, 2011).

7.2.5 Korean Marine Environment Management Cooperation (KOEM)
The central government is only available to make policy and has no time and human resource for programs and activities. For the implementation of the policy the government is cooperating with KOEM. When the government is making a national plan for a certain area, KOEM will try to implement that. This does not happen directly by taking action, but KOEM are more the coordination of it. KOEM creates the venue for all the stakeholders (including the local government) in the same place to make an action plan (Lee, 2011).

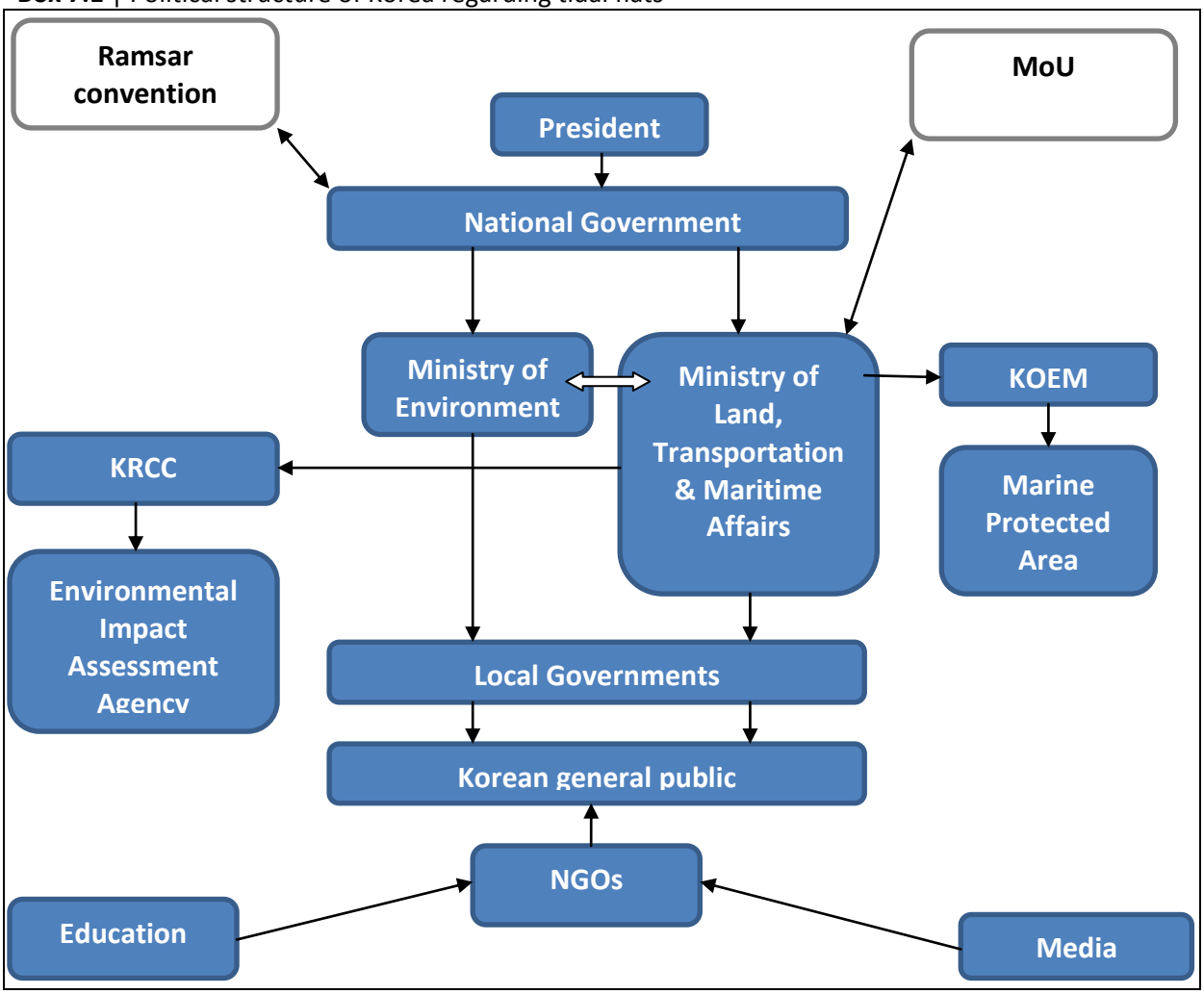
7.2.6 Environmental Impact Assessment Association (EIAA)
Korea has the legal authority to require environmental impact assessments for both public and private projects that may affect coastal landscapes and tidal wetlands (Hong et al. 2008). This done by a private institution called the environmental impact assessment association (EIAA). They have to conduct this investigation by law and is done on the national level (Marencic & Enemark, 2011). Kang (2011) indicated that is matters who does the assessment. Sometimes he hears that the government is pushing the institution to write a good report in order to realize the construction. Both Kang (2011) and Marencic & Enemark (2011) see this a as problem that happens practically anywhere in the world and therefore also in Korea.

7.2.7 Korean Rural Community Cooperation (KRCC)
The KRCC is a semi-governmental organization which is responsible for the actual carrying out of the land reclamation and its infrastructure, after the government has made the decision to do a land reclamation. KRCC is developing everything that has to do with tidal flat reclamation. If they do nothing, there will be no destruction of the tidal flats, but the government eventually has the power to decide whether they want to keep the tidal flats or not (Kang, 2011).

According to Kang (2011) the situation in Korea is it is different than in the Netherlands. In the Netherlands there is hardly any land reclamation going on anymore. But in Korea it is KRCC's job to look for new projects and when they know that there is no big opposition in Korea, they will continue to reclaim. In Korea land reclamation is done by only one semi-governmental company, namely KRCC (Kang, 2011).

7.2.8 Non-governmental organizations (NGOs)
The role of NGOs in Korea was discussed in the previous chapter, but they have to be mentioned as an actor that plays a role in the complex system of interaction between all the actors.

Box 7.1 | Political structure of Korea regarding tidal flats



Source: Heslinga (2011)

7.3 Nation laws and agreements for protection of tidal flats

The republic of Korea stated that several ministries will regularly monitor the situation on the tidal flats to minimize the ecological impact, these result will be communicated and that intertidal mud flats will be should be preserved and that no large-scale reclamation will appear in Korea. This might sound encourage according to Birds Korea (2011), but the situation is unfortunately not that simple and clear.

7.3.1 Wetland Conservation Act (WCA)

Kil (2011) says that there is an national act for the conservation of wetlands, called the wetland conservation act. It is for both inland an coastal wetlands and basically the act that governs the protection and conservation of wetlands in Korea. This act actually empowers the government to designate certain areas as Wetland Protected Areas (WPAs) and this acts also shows how to manage these wetland areas and therefore this law is actually quite significant (Kil, 2011). According to Je (2011) the wetland conservation act was established during the Saemangeum campaign. This is the result of what happened in Sihwa and Saemangeum, because of people became more aware of tidal flats then. Because of this act the government is doing investigation on the wetlands in Korea and they established some protected areas already. Even though the act is part of the government, the government

cannot reclaim WPAs like they can reclaim other area (Je, 2011). This act might look promising for the Korean tidal flats, but the wetland conservation act has several weaknesses according to Birds Korea (2011). First, the wetlands conservation act has no jurisdiction outside the boundaries of an areas that has been designated as WPA. The majority of the tidal wetlands in Korea are not assigned to this act and are therefore still subject to planning and development. Second, some areas this are WPAs, can still be influenced by construction and reclamation projects next to the WPA. It is also strange that there is an act to protect the tidal wetlands, but still all kind of projects can happen. According to Koh (2011) this is because there is also a development act and these acts compete each other. Every governmental department has something to say and can make their own acts, but who is the most powerful is defined by the hierarchy. The higher in the hierarchy, the more powerful the department is and it depends which department has the most power. Every act or law has the same power, but the actual decision is different and the decision is eventually made by the government (Koh, 2011).

7.3.2 Marine Protected Areas (MPAs)

There is another act under national legislation for the protection of wetlands according to Lee (2011, namely marine protected areas (MPAs). KOEM is the organization that could designate some areas as MPA and once it is designated the government will channel the budget for protecting those areas. Lee (2011) says that the MPAs are under two national legislations. One is the 'act on marine environmental conservation and environmental action in the marine ecosystem' and the other one is the wetland conservation act. And the last one is a little bit special, because the ministry of environment and the ministry of maritime affairs have to work together (Lee, 2011). Kang (2011) says that MPA don't protect the tidal flats of Korea, because MPAs are related to fisheries and not to tidal flats. An MPA means that the government makes protection area where the fishing boats are not allowed to fish. This is to protect the fish and to prevent the seas to become 'empty'.

7.3.3 Designation Procedures

In the previous paragraphs it became clear that the measures for the protection for the tidal flats are quite limited in Korea and that they have some downsides. According to Hong et al. (2008) the environmental management measures for the protection of Korea's tidal flats must find a balance between the pressure for development and the pressure of preserving their ecological qualities. But Hong et al. (2008) say that many laws governing conservation have not achieved that balance, but have favoured rapid economic growth instead. The measure for the protection of the tidal can be characterized as areas where nothing can happen, unless it becomes a case of national interest and national need (Kang, 2011). According to Kang (2011) it is quite easy to cancel the protected status of a certain area. For example when there is a tidal flat area, where it is very easy to make a dyke and use it as agricultural land, the ministry of agriculture will report to the law house that they want to develop this area. Then they need the Great National Party to support the plan and if there is not that much opposition, they will ask the minister of environment to cancel the designation and then they can develop this area. It is all up to the ruling party and the government, only some opposition can stop them, because Korea is still a democratic country. Besides that the government also needs the support of the Korean people in order to be re-elected, therefore they cannot ignore the complaints of the people completely. Last year for example the ministry of LTM tried to cancel the designation for the Incheon area to

make a tidal power plant (Kang, 2011). This is a power plant, that generates power by using the tides. It might look less destructive to the ecosystem than land reclamation, but that is not the case.
Even the Korean president can cancel a protected areas designation, but it is very hard to get rid of it according to Lee (2011), because it is legally binding. The president needs the approval of the public, he should negotiate with different parties and different kind of governmental agencies, check the environmental impact assessment again and undertake lots of bureaucratic steps. Lee (2011) says that there should be a national need to get rid of the MPA status and it has to be proven to be more important than the natural values.

7. 4 International Treaties

The Korean tidal flats are not just important for the nation of Korea, but the tidal flats of Korea have also international importance. In chapter 4 was explained that the Korean tidal flats are quite unique in the world and are crucial for the survival of migratory birds. In order to get this recognition Korea has signed up for international treaties (Ramsar Convention) and tries to look for international cooperation (Memorandum of Understanding).

7.4.1 Ramsar Convention

The Convention on Wetlands of International Importance, also known as the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. It was established in the Iranian city of Ramsar in 1971 and it eventually functioned in 1975. In short the mission of the Ramsar Convention is the following:

> *"the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world".*
> Source: Ramsar (2011)

Korea has become a member since 28-07-1997 and since that data Korea has assigned 17 sites to the Ramsar criteria with the total surface of 17677 hectare (Ramsar, 2011). All the Ramsar sites, the data of assigning, their surface and position can be seen in figure 7.1.

Figure 7.1 |Ramsar site in Korea

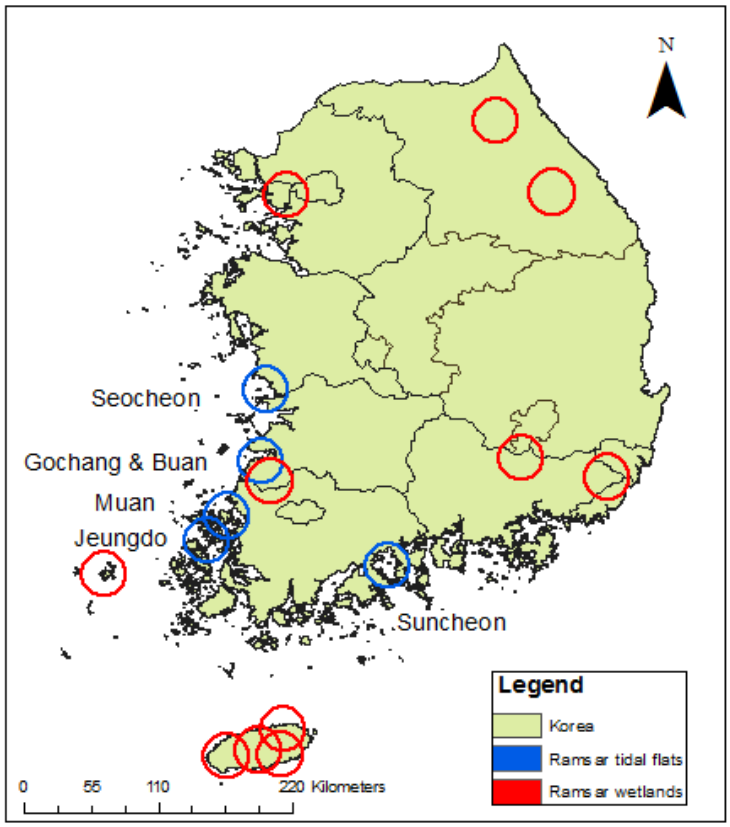
1100 Altitude Wetland	*12/10/09*	Jeju-do (Island)	13	ha	33°21'N 126°28'E
Dongbaekdongsan	*14/03/11*	Jeju-do	59	ha	33°31'N 126°43'E
Du-ung Wetland	*20/12/07*	Chungcheongnam-do	6	ha	36°49'N 126°11'E
Ganghwa Maehwamarum Habitat	*13/10/08*	Incheon Metropolitan City	1	ha	37°38'N 126°32'E
Gochang & Buan Tidal Flats	*01/02/10*	Gomso Bay	4,550	ha	35°33'N 126°35'E
Jangdo Island High Moor	*30/03/05*	Chollanam-do	9	ha	34°41'N 125°23'E
Jeungdo Tidal Flat	*29/07/11*	Jeollanam-do	3,130	ha	34°58'30"N 126°10'16"E
Moojechineup	*20/12/07*	Ulsan	4	ha	35°27'N 129°08'E
Muan Tidal Flat	*14/01/08*	Joellanam-do	3,589	ha	35°06'N 126°23'E
Muljangori-oreum wetland	*13/10/08*	Jeju-do (Island)	63	ha	33°24'N 126°36'E
Mulyeongari-oreum	*18/10/06*	Jeju-do (Island)	31	ha	33°22'N 126°42'E
Odaesan National Park Wetlands	*13/10/08*	Gwangwon-do	2	ha	37°48'N 128°38'E
Seocheon Tidal Flat	*02/12/09*	Chungcheongnam-do	1,530	ha	36°00'N 126°30'E
Suncheon Bay	*20/01/06*	Jeollanam-do	3,550	ha	34°48'N 127°24'E
The High Moor, Yongneup of Mt. Daeam	*28/03/97*	Kangwon-do	106	ha	38°13'N 128°07'E
Ungok Wetland	*07/04/11*	North Jeolla Province	180	ha	35°28'N 126°39'E
Upo Wetland	*02/03/98*	Kyongsangnam-do	854	ha	35°33'N 128°25'E

Source: Ramsar (2011)

This might look like Korea is doing a wonderful job in protection their tidal flats, but some remarks have to made. In the first place Marencic & Enemark (2011) say that the sites that

Korea has enlisted to the Ramsar criteria are still not many, and even more important to notice is that the sites that have been enlisted are very small, especially compared to all the tidal flats that were reclaimed and lost. Second, in this research the focus is on the tidal flats in Korea and the Ramsar convention is about wetlands in general. A further analysis of the list of Ramsar sites shows that from the seventeen Ramsar sites that Korea has enlisted, only five of them are actually tidal flats. These are Jeungdo, Gochang & Buan, Muan, Seocheon and Suncheon tidal flat. Third, Koh (2011) says that the Ramsar convention has more or less symbolic meaning. Being part of the Ramsar convention is based on a kind of voluntary commitment and therefore not legally binding for the Korean government (Lee, 2011). The national government can assign Ramsar sites to the convention when they have the right criteria, but when the national government changes their minds about tidal flat protection it is quite easy to get rid of the Ramsar status. It is a more symbolic action to show to the international world that Korea doing a good job in protecting wetlands (Koh, 2011).
Je (2011) disagrees with Koh (2011) and thinks that the Ramsar convention has a real meaning and not just a symbolic meaning, namely before a tidal flats area is assigned as a Ramsar site for international conservation is also covered by national law. Marencic and Enemark (2011) emphasize that being enlisted to the Ramsar Convention is not the same as an integrated national coastal policy, because Korea does not have such a thing.

Map 7.1 | Ramsar sites Korea



Source: Ramsar (2011) Edited by Heslinga in GIS (2011)

But being assigned to Ramsar has of course benefits for the Korean society despite all the remarks mentioned above. According to Kang (2011) it can be very helpful for educating the Korean people about tidal flats and in that sense it is a good way to create more public awareness for nature in general and specifically for tidal flats in Korea. If there is more

awareness under the Korean people they might realize that their tidal flats are unique in the world and that they should be protected more. Lee (2011) agrees with the previous opinion and emphasized the role the Ramsar Convention played in 2008. In this year Korea organized the 10th Conference of Contracting Parties (COP10) in Changwon and this event drew a lot of nationwide media attention, which also contributes to the public awareness of the Korean people. People realize that there are tidal flats along their coasts and that they are very important in natural terms (Lee, 2011). Interesting about the Changwon convention in 2008 is that Korea officially declared not to reclaim tidal flats anymore. But Lee (2011) says that many people don't realize that the projects who were planned already will proceed, this is because the government already made agreements and invested money in the projects. But ordinary people think differently and they believe that the government will not do reclamation anymore.
Also the World Wetlands Days can be an important event for raising more public awareness. Every year on the 2nd of February government agencies, non-governmental organizations, and groups of citizens at all levels of the community can take advantage of the opportunity to undertake actions aimed at raising public awareness of wetland values and benefits in general and the Ramsar Convention in particular (Ramsar, 2011).
Next to the Ramsar Convention the government is now busy with applying for some tidal flats to become UNESCO world heritage (both nature and culture). This also could lead to more awareness under the Korean population (Marencic & Enemark, 2011).

7.4.4 Memorandum of Understanding (MoU)
Next to international recognition by the Ramsar convention Korea has also signed a memorandum of understanding with the countries from the Wadden sea , namely Denmark, Germany and the Netherlands. The Common Wadden Sea Secretariat (CWSS) was established in 1987 in Wilhelmshaven (Germany) as the secretariat for the trilateral cooperation. Its primary task is to support, initiate, facilitate and coordinate the activities of the collaboration (CWSS, 2011). The MoU was signed in 2009 and according to Koh (2011) it is a short of exchange program between Korea and the trilateral cooperation. There has been a Wadden sea symposium and also ministerial meetings where the government are participating. Koh (2011) says that these meeting are very important for decision making and the policy making process for the Korean government. The MoU is important for Korea in order how to learn about the policy, the system of legislation and institutions of the Wadden sea countries. But also the practical implementation of it, like monitoring and assessment. This is why the conservation office of the ministry of LTM has joined the MoU, because they want to learn about the conservation and protection of wetlands (Koh, 2011).
According to Marencic & Enemark (2011) the memorandum of understanding between the trilateral cooperation and Korea has three pillars, namely:

- Policy and management
- Monitoring: more and better data gathering about birds, benthos etc.
- Education: provide more education about tidal flats and build info centres

Marencic & Enemark (2011) says that he CWSS tries to transfer their 'success' to Korea, so they can be an example for Korea. The situation in the Netherlands, Germany and Denmark is that the governments knows about the importance of tidal flats areas, there are good NGOs who are fighting for the interests of tidal flats, there are good information centres,

which can provide education and information and the different governments, NGOs and scientist are more interlinked and interwoven with each other.

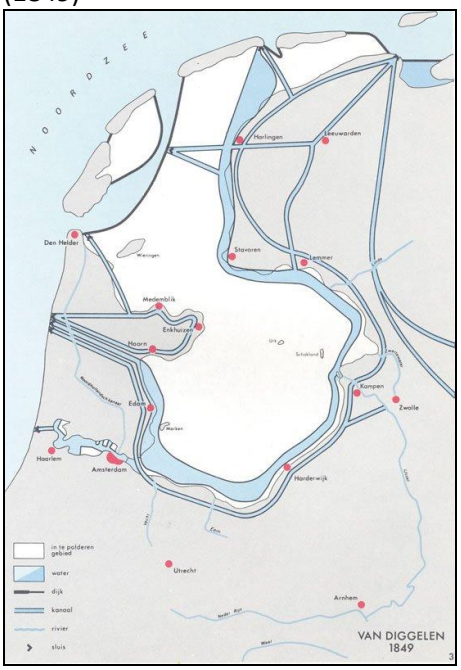
7.5 Korea's future

Je (2011) thinks that in the future it will be hard for the Korean central government to develop land reclamation projects in the coastal wetlands again, but local government will develop only on the small size wetlands. Kil (2011) says that in the future land reclamation projects will continue, but not like in the seventies and eighties. They will be quite smaller than for example the Saemangeum project and only projects that require a public need will be reclaimed (Kil, 2011). Koh (2011) claims that the government also has planned bigger projects. According to him three or four big projects have been planned, for example Donjingang. At least new treat for the tidal flats in Korea is the tidal power plant, which might seem less harmful, because water can come through, but it does just a much damage to the environment as reclaiming land (Marencic & Enemark, 2011).

7.6 Comparison with the Netherlands

The Netherlands had a strong reclamation tradition and lots of ambitious embankment plans (figure 7.2). The Wadden sea was in a bad state about forty years ago and people were worried about the future of the Wadden sea and therefore protective measures for the Wadden sea were necessary. Throughout the recent decades the awareness that the Wadden sea is a unique ecosystem has grown under policy makers and different stakeholders in the Netherlands.

Figure 7.2 | The 'Van Diggelen ' plan (1849)



Source: Wikipedia (2011)

In the second note for planning in 1966 the Wadden area in general was not mentioned, except form some specific comments. In 1973 this changed and the management of the Wadden sea and the islands as nature became more important and there was a need for an unambiguous and coordinated national policy. The application of the nature protection law was realized in 1977 and nature became the main goal of the Wadden sea. A year before the provinces have also made an agreement to have a joint policy to keep the Wadden area as a coherent natural area. In 1980 the natural values of the Wadden sea became the main goals for the first core decision in planning for the Wadden sea (In Dutch: PKB Waddenzee) and in 1991 the Wadden sea was designated as a core area in the ecological main structure (In Dutch: Ecologische Hoofdstructuur). In 1994 and 2007 the second and third note for the Wadden sea came into force and sustainable protection and development of the Wadden sea as nature became important and also the maintenance of the Wadden sea as a unique open landscape (Oosterveld, 2011).

Just like in Korea, there is a struggle going on in the Netherlands between actors who want the economic and ecological use of the tidal flats. But in the Wadden sea is most of the cases were decides in favour of the nature protection (Oosterveld, 2011), while in Korea

that many laws governing conservation have not achieved a balance between economy and nature, but have favoured rapid economic growth (Hong et al., 2008).
In the Netherlands, a main concern was that laws were not coordinated and for example two different types of use for a certain areas of land can be designated. To get a well-coordinated policy for the Wadden something that is hard to achieve, but due to intensive cooperation between different governments non-coordinated development belong to the past (Oosterveld, 2011). A similar problem can now be seen in Korea were for example a conservation act an development act both make policy for tidal flat areas, but in a different way. In the Netherlands a shift has taken place from a sectorial policy to a more integrated policy between these sectors. Still there has to be emphasised that the situation in the Netherlands is quite complex. Because the large amount of stakeholders, it sometimes can be very hard to have a well-coordinated policy in the Netherlands.
An important difference between Korean and the Netherlands lies in the political culture. Korea is still a young democracy the political (and social) system is still based on hierarchy, while in the Netherlands there is a political culture of debating and negotiating between the different stakeholders with their different interests, which is called 'polderen'.
Nowadays, a development can be seen in the Wadden sea nature policy according to Oosterveld (2011). Some decades ago, the nature policy for the Wadden was focussed on regulation by bans and permits with the accent on conservation and protection. Now the accent is on nature recovery and looking for solutions with the users.
In the literature Rotmans (2001) spoke about transitions that can occur in a society. Based on this research it can be said that the Netherlands and Korea are experiencing a similar pattern in the multi phases model that was described by Rotmans (2011), only Korea is now in the same position as the Netherlands 40-50 years ago. Also, Rotmans described a multilevel transition model, where development have to occur on all the levels and strengthen each other. In the Netherlands the landscape, the regimes and the niches are more or less connected, but in Korea the landscape for tidal flat conservation is quite fragile, the regimes says that they understand, but act sometimes different and initiative by for example NGOs are mainly about demonstrating.

7.7 Summary

The Korean political system is very complex and therefore hard to explain in one chapter of a thesis, but some differences and similarities can be seen between Korean and the Netherlands.
A difference is that the Korean democracy is still quite young and therefore the political system is still quite hierarchic compared to the Netherlands. Also can be said that the different government department on different levels do not cooperated that well, this is because Korea lacks of a good integral policy for the management of their tidal flats.
Another difference is that the government in the Netherlands is more aware of the importance of tidal flat, compared to the Korean government. In the Netherlands for example most of the cases were decides in favour of the nature protection while in Korea that many laws governing conservation have not achieved balance, but have favoured rapid economic growth.
In the Netherlands the landscape, the regimes and the niches are more or less connected, but in Korea the landscape for tidal flat conservation is quite fragile, the regimes says that they understand, but act sometimes different and initiative by for example NGOs are mainly about demonstrating.

The MoU between Korea and between the Trilateral Cooperation is a good thing for Korea in order to help them to get a better use and management of tidal flats by learning about policy and management, monitoring and education. The Ramsar criteria have mainly a symbolic meaning, because they are not legally binding, but they are good for creating public awareness for the Koreans, that their tidal flats have international importance.

Chapter 8: Conclusions and recommendations

8.1 Introduction

The final chapter of this thesis is the conclusion and in this chapter the sub questions that were asked in the introduction will be answered and eventually what lessons can Korea and the Netherlands learn from each other, regarding their approaches towards the use of tidal flats will be answered. Finally, there will be given some advice for further research and the methodology that was used in this thesis will be reflected.

8.2 Physical differences and similarities between Korea and the Netherlands

The first sub question was about the differences between Korea and the Netherlands regarding the use of tidal flats in physical terms (Geology, Geography, Ecology). In geographical terms it can be said that the tidal flat in Korea en the Netherlands are about the same size and they are both part of a larger whole. The differences are that in the Netherlands the tidal flats are a more coherent whole, surrounded by big barrier islands made of sand, which are located in a shallow lagoon which can be classified as micro tidal. While in Korea the tidal flats are more fragmented and spread along the Korean coast like a mosaic. The types of tidal flats are more diverse (estuarine, embayed, open marine) than in the Netherlands and the shores are more steep and rocky and can be classified as macro tidal.

In terms of geology, both tidal flats were established in the Holocene geological time period, but have different appearances, due to earlier geomorphological time periods.

Both tidal flats in Korea and the Netherlands are unique tidal wetland because of their high biodiversity. For both countries the tidal flats considered as important hub for migratory birds to rest and feed themselves with all kind of benthos types (clams, worms, shrimp, etc.) who live in the tidal flats. In both tidal flats the sea grass is under threat or almost gone. The Wadden sea area is also a nursery areas for fish and an important resting areas for marine mammals like seals. The Wadden sea and the Korean tidal flats are both unique ecosystems which are also important to the world, but are different in geographical terms and appearances.

8.3 Economic differences and similarities between Korea and the Netherlands

The second sub question was what about the differences are between Korea and the Netherlands in terms of the use of tidal flats in economic terms (Demography, Economy). The Korean population is mainly concentrated on the northwest part of Korea around Seoul and Incheon and the tidal flats can be found in the entire west and south of the Korean coast. Therefore can be said that the Korean tidal flats are both in highly populated areas as in areas as were the population density is quite low. In the Netherlands, the tidal flats areas are in the north of the country, which is the least populated area of the Netherlands and especially the areas along the tidal flat coast have a low population density compared to the rest of the country.

To say something about the economic situation of the tidal flats areas the regional GDP (per capita) was analysed. In Korea the tidal flats are both in areas with a high and low GDP, but the GDP per capita this differences in GDP per capita are quite small. In general terms, tidal flats areas in Korea are considered are underdeveloped, compared to the rest of the country. In the Netherlands the Wadden sea area is also quite under developed.

In both countries agriculture is one of the most important sector in the tidal flats area, especially in the mid- and southwest of Korea. Also fishing is important in both countries, but have a different character. In the Netherlands this happens on a large scale, while in Korea still traditional methods are used, which are less destructive for the ecosystem. Especially in the northwest of Korea the industrial sector is very important and in this area around Seoul and Incheon a lot of land reclamation has taken place in order to make land for industrial complexes. In the Netherland there is also industry, but this focusses on the Eems/ Dollard region and gas drilling. Tourism and recreation is the most important sector on the islands Wadden sea area, while in Korea this sector is still in its infancy.

8.4 Social differences and similarities between Korea and the Netherlands

The third sub question was about the differences between Korea and the Netherlands regarding the use of tidal flats in social terms. Bot Korea and the Netherlands have a strong historical tradition in land reclamation. In Korea there has been a lot of small scale reclamation going on in the twentieth century, because Korea has a lack of agricultural farmland due to mountains. Economic growth in the 1960s and 1970s led to an even bigger demand for land and this led to the enlargement of the scale of land reclamation in Korea. In the Netherlands land reclamation was also conducted under economic pressure, but the difference is that it was also needed for protection of their coastline.

In the Netherland the attitude towards changed since the 1970 when policy was conducted for protection of the Wadden sea and made the Wadden sea important. Not only environmentalist groups and the politics gave more attention to it, but also other interest groups and the commerce. In Korea the first environmental awareness was in the 1980s and the public awareness is still developing.

Important events that led to a rise in awareness of the Korean people were the Rio summit (1992), the Sihwa failure and the Saemangeum controversy. NGOs then managed to get public attention by demonstrating and using the media. During the Saemangeum campaign most of the population was against land reclamation in tidal flats areas, but now this is about fifty-fifty. Koreans are still divided about the subject of land reclamation, because in some areas people think reclamation is important and while people in other areas see the natural values of tidal flats. Based on this research's survey and statements of Je (2011) also a gender and age difference can be seen in the attitude towards tidal flats conservation, but in general there are more and more people who think that conservation is more important than development of the tidal flats. Despite this, the position of the Korean NGOs is not quite as strong as in the Netherlands, because they lack of a good organizational structure, political influence and financial funding.

Based on this research it can be said that in Korea the vision of the people towards nature has been mainly functional, but there has been a small shift to a vision where man is more of a ruler over nature and there is a win-win situation between nature and economy. In the Netherlands the attitude is more nature oriented then in Korea and for a long time the vision was that nature and economy are as water and fire. But now in the Netherlands some areas are left over to the nature on the one hand, but on the other hand there are also economic activities going on in the Wadden sea.

8.5 Political differences and similarities between Korea and the Netherlands

The final sub question of this research was focussing on the differences between Korea and the Netherlands regarding the management of tidal flats in political terms? (Politics, Juridical)
The Korean political system is very complex and therefore hard to explain in one chapter of a thesis, but some differences and similarities can be seen between Korean and the Netherlands. An important difference is a culture one. The Korean democracy is still quite young and therefore the political system is still quite hierarchic compared to the Netherlands, which is more focussed on debating and negociating. Also can be said that the different government department on different levels do not cooperated that well, this is because Korea lacks of a good integral policy for the management of their tidal flats.
Another difference is that the government in the Netherlands is more aware of the importance of tidal flat, compared to the Korean government. In the Netherlands for example most of the cases were decides in favour of the nature protection while in Korea that many laws governing conservation have not achieved a balance between economy and nature, but have favoured rapid economic growth instead. In the Netherlands the landscape, the regimes and the niches are more or less connected, but in Korea the landscape for tidal flat conservation is quite fragile, the regimes says that they understand, but act sometimes different and initiative by for example NGOs are mainly about demonstrating.
The MoU between Korea and between the Trilateral Cooperation is a good thing for Korea in order to help them to get a better use and management of tidal flats by learning about policy and management, monitoring and education. The Ramsar criteria have mainly a symbolic meaning, because they are not legally binding, but they are good for creating public awareness for the Korean, that their tidal flats have international importance.

8.6 Lessons Korea and the Netherlands can learn from each other

Throughout the different chapters in this research became clear that there are many differences and similarities between Korea and the Netherlands in terms of the use, approach and management of tidal flats. Based on these similarities and differences between Korea and the Netherland this research will give an answer to the research's main question:

What lessons can Korea and the Netherlands learn from each other, regarding the use approach and management of tidal flats?

First, in comparison to the Netherlands, Korea lacks of an integral national policy for the management of the tidal flats. Different levels of governments and departments make their own policy for tidal flats. This is not very efficient and sometimes contrasting policies for the same area can occur. Korea should get an integrated national policy, but still then there is a long way to go. Countries like the Netherlands are also struggling with the decision making for tidal flats policy, because of the large amount of stakeholders and their interests.
Second, the position of the NGOs in Korea is not very strong and if they want to improve the public awareness in Korea, NGOs have to become stronger and convince the public with technical strong arguments that tidal flats are important. Also Korea's NGOs need to have a better funding, political influence and a better organization. A better structure of the NGOs can help to work more efficient, instead of that every NGO does their own research and demonstrations. Cooperation and sharing their data can be very helpful with that.

Third, NGOs can play an important role in getting public awareness, but eventually this is something that has to come from the people itself. In order to get a better understanding, awareness and appreciation of tidal flats in Korea, the role of education is crucial. This can be done by creating tidal flat centre along the coast or to teach about tidal flats at schools. But also eco-tourism can be a good way for the Koreans to explore and experience their tidal flats.
The Memorandum between Korea and the Trilateral Cooperation of the Wadden sea can be very useful in helpful for Korea to learn from countries that already have experienced similar problems. The three pillars of the MoU: policy and management, monitoring and education are the issues Korean struggles with and where Korea might learn something from a country like the Netherlands
Finally, a lesson that the Netherlands can learn from Korea is that the Korean tidal flats are more heavily used in comparison to the Netherlands. In Korea the tidal flats still have local importance for fishermen and this is also reflected in their culture by traditions, methods and food. In the Netherlands still link is less strong and is mainly achieved by tourism.

8.7 Advice for further research

This thesis had an explorative character to get a better understanding of what is going on with the tidal flats in Korea and therefore the research is quite descriptive. In order to get a better image of how the Korean situation can be improved, it can be a good idea to calculated the values of nature that Blom & van Soest (2003) distinguished in the theoretical chapter of this thesis. By calculating also the social and intrinsic values next to the economic values stronger arguments can be given to convince Koreans that land reclamation is not always the best solution, especially on the long term.
This is not very easy to do, but there is some literature available that can help to calculate values and non-values of nature, for example 'Economic valuation of wetlands (Barbier et al, 1996). What also can be done to get a better balance between economic and natural interest is a social cost benefits analysis (Dutch: MKBA), which gives a better insight in the social return of investments for utility and necessity of a construction project like Saemangeum for example.

8.8 Reflection on the used methodology

After the execution of the research, a reflection to the used methodology described in chapter 3 can be made. An important notion is the lack of availability of data in English. Most of the data was in Korean and therefore not valuable for this research. Also the statistical data sources and reports were in Korean and therefore it was not possible to do an analysis on the level of the Korean counties for example. This means that the scale of the analysed areas is not always on the scale that was set as ideal in the methodology.
In the methodology was said that a one-on-one comparison between Korea and the Netherland would be hard to achieve and that became true. Despite that, this research can give a good impression of what is going on in Korea and some direction what needs to happen in the future.

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Attachment 1: List of people that have been interviewed

1. **Interview with Namue Lee**

Name: *Namue Lee*
Organisation: *KOEM (Korean Marine Environment Management Coorporation)*
Department: *Marine Protected Area (MPA's)*
Date: *26-05-2011*
Location: *KOEM office (MPA centre) in Seoul*
Comment: *Average English speaker.*

2. **Interview with Dr. Jong Geel Je**

Name: *Dr. Jong Geel Je*
Organization: *Korea Ocean Research Institute / Ecotourism Korea*
Department:
Date: *31-05-2011*
Location: *Hotel lobby in Gwacheon*
Comment: *Average English speaker and some background noise*

3. **Interview with Sehwan Yoo**

Name: *Sehwan Yoo*
Organization: *Ministry of Land, Transport and Maritime Affairs (MLTM)*
Department: Environment and Labour Committee as a legislative researcher in charge of environmental policy.
Date: *31-05-2011*
Comment: *Interview was done by email*

4. **Interview with Hojin Kang**

Name: *Hojin Kang*
Organization: *Ministry of LNV (Dutch embassy)*
Department: *Agricultural Policy Officer*
Date: *01-06-2011*
Location: *Dutch Embassy in Seoul*
Comment: *Some background noise*

5. **Interview with Chul-Hwan Koh**

Name: *Chul-Hwan Kho (Professor in Marine Ecology)*
Organization: *Seoul National University*
Department: *School of Earth and Environmental Sciences: College of Natural Sciences*
Date: *02-06-2011*
Location: *Hotel lobby in Seoul*
Comment: *Background noise*

6. **Interview with In-Hoan Kil**

Name: *In-Hoan Kil*
Organization: *Ministry of Land, Transport and Maritime Affairs (MLTM)*

Department: *Marine Policy Bureau, Coastal Planning and Management Division*
Date: *02-06-2011*
Location: *Minstery of MLTM in Gwacheon*
Comment: *Not an English speaker. Interview was conducted with the help of a translator. Questions were handed in before the interview.*

7. Interview Marencic & Enemark

Name: *Harald Marencic & Jens Enemark*
Organisation: Common Wadden sea Secretariat (CWSS)
Date: *22-11-2011 (14.00-16.00)*
Location: *Office CWSS in Wilhelmshaven*
Comment:

Attachment 2: Main structure for interview questions

Introduction:

1. What is your name?
2. What is your organisation and what does it do?
3. What is your job at the your organisation

Economical

4. Is the area where tidal flats are, a poor and undeveloped area?
5. What is the dominant economical sector in the areas of tidal flats? (agriculture, industry, etc etc)
6. To what extent do Koreans see land reclamation projects as a chance for welfare and prosperity?

Social

7. What is the Korean attitude towards nature in general?
8. What do Koreans think about tidal flats (do they know they exist)?
9. What do Koreans in general think about land reclamation projects, like Saemangeum?
10. Has the attitude towards land reclamation of tidal flats changed over the past years?

Political

11. What does the Korean government think is more important: economic growth or protection of the tidal flats?
12. Is there a difference in approach towards tidal flats between the national government and the local governments?
13. What does the Korean government do to preserve tidal flats?
14. Does the government compensate lost wetlands due to land reclamation?
15. What is the juridical status in Korea of act/laws to protect tidal flats? For example, are Marine Protected Areas binding?
16. What is the juridical status in Korea of international wetland protection treaties, like the Ramsar criteria?
17. Will there be more reclamation projects in the future?

Attachment 3: Survey questions

Question 1:
간척 사업에 대해서 어떻게 생각하십니까?

Question 2:
새만금에 대해서 어떻게 생각하십니까?

Question 3:
다음 중 어떤 것이 더 중요하다고 생각하십니까? 경제 발전 / 갯벌 보호

경제 발전

갯벌 보존

Attachment 4: Results of the survey

What do you think about land reclamtion in general?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Negative	19	38,0	38,0	38,0
	No opinion	4	8,0	8,0	46,0
	Positive	27	54,0	54,0	100,0
	Total	50	100,0	100,0	

What is your opinion about Saemangeum?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Negative	17	34,0	34,0	34,0
	No opinion	4	8,0	8,0	42,0
	Positive	29	58,0	58,0	100,0
	Total	50	100,0	100,0	

What do you think is more important: development or conservation?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Both	3	6,0	6,0	6,0
	Conservation	31	62,0	62,0	68,0
	Development	13	26,0	26,0	94,0
	No opinion	3	6,0	6,0	100,0
	Total	50	100,0	100,0	

Age * What do you think about land reclamtion in general? * Gender Crosstabulation

				What do you think about land reclamtion in general?			
Gender				Negative	No opinion	Positive	Total
Female	Age	Female (Old)	Count	4	1	4	9
			% within Age	44,4%	11,1%	44,4%	100,0%
		Female (Young)	Count	8	0	4	12
			% within Age	66,7%	0,0%	33,3%	100,0%
	Total		Count	12	1	8	21
			% within Age	57,1%	4,8%	38,1%	100,0%
Male	Age	Male (Old)	Count	4	1	7	12

			% within Age	33,3%	8,3%	58,3%	100,0%
		Male (Young)	Count	3	2	12	17
			% within Age	17,6%	11,8%	70,6%	100,0%
	Total		Count	7	3	19	29
			% within Age	24,1%	10,3%	65,5%	100,0%

Age * What is your opinion about Saemangeum? * Gender Crosstabulation

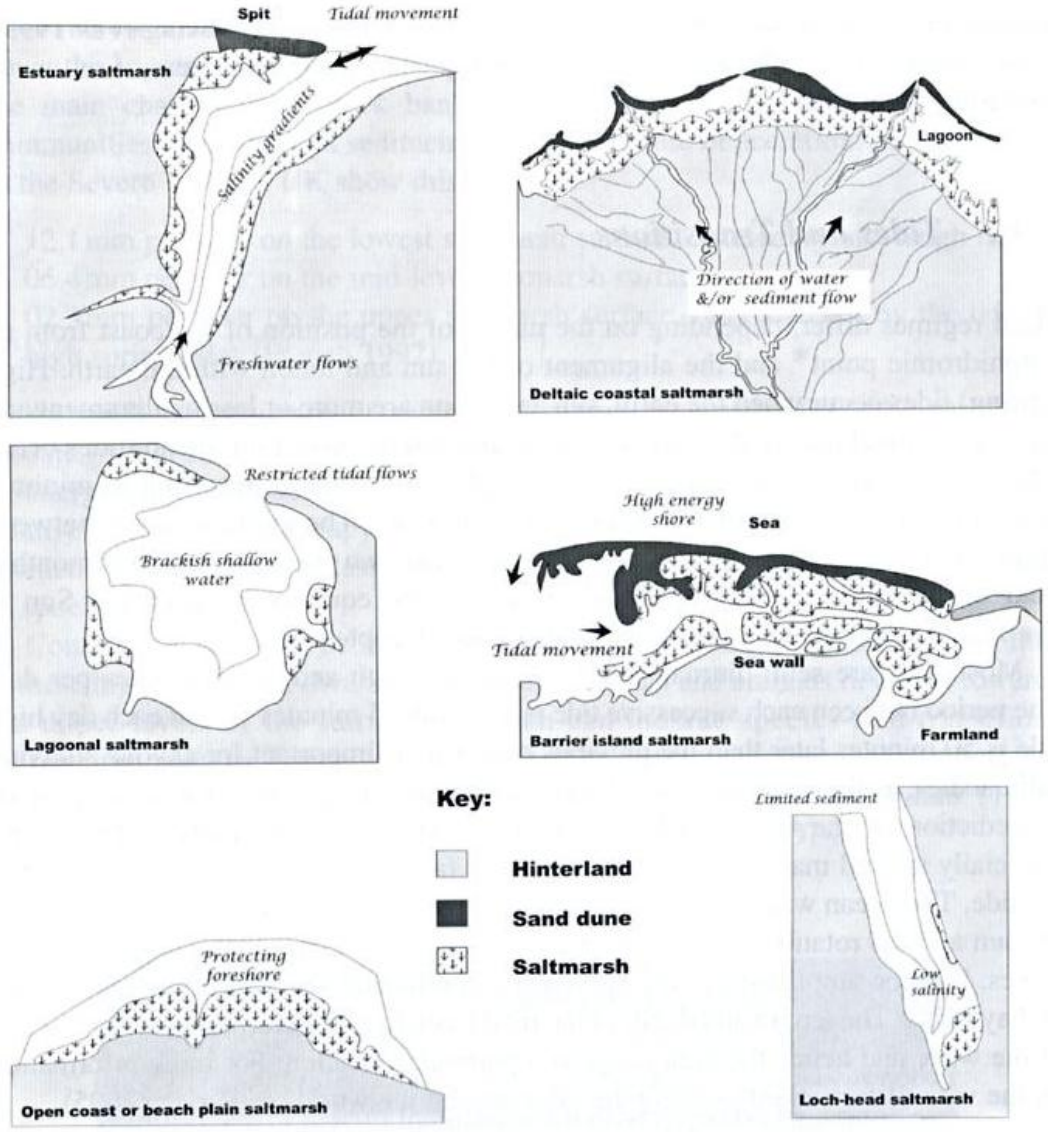
				What is your opinion about Saemangeum?			
Gender				Negative	No opinion	Positive	Total
Female	Age	Female (Old)	Count	4	1	4	9
			% within Age	44,44%	11,11%	44,44%	100,00%
		Female (Young)	Count	7	0	5	12
			% within Age	58,33%	0,00%	41,67%	100,00%
	Total		Count	11	1	9	21
			% within Age	52,38%	4,76%	42,86%	100,00%
Male	Age	Male (Old)	Count	4	1	7	12
			% within Age	33,33%	8,33%	58,33%	100,00%
		Male (Young)	Count	2	2	13	17
			% within Age	11,76%	11,76%	76,47%	100,00%
	Total		Count	6	3	20	29
			% within Age	20,69%	10,34%	68,97%	100,00%

Age * What do you think is more important: development or conservation? * Gender Crosstabulation

				What do you think is more important: development or conservation?				
Gender				Both	Conservation	Development	No opinion	Total
Female	Age	Female (Old)	Count	0	7	1	1	9
			% within Age	0,0%	77,8%	11,1%	11,1%	100,0%
		Female (Young)	Count	1	10	1	0	12
			% within Age	8,3%	83,3%	8,3%	0,0%	100,0%
	Total		Count	1	17	2	1	21
			% within Age	4,8%	81,0%	9,5%	4,8%	100,0%
Male	Age	Male (Old)	Count	1	6	4	1	12
			% within Age	8,3%	50,0%	33,3%	8,3%	100,0%
		Male	Count	1	8	7	1	17

	(Young)	% within Age	5,9%	47,1%	41,2%	5,9%	100,0%
Total		Count	2	14	11	2	29
		% within Age	6,9%	48,3%	37,9%	6,9%	100,0%

Attachment 5: Tidal flat types



Source: Doody (2008)