Summary

This PhD project deals with the history of the process of embanking (polders) and of water boards in the central part of Zealand Flanders (the Netherlands) since 1600. The main objective was how this embanking process and the tasks of the water boards have developed between 1600 and 1999 and, also how the development of the area proceeding 1600, has had an impact on later developments. This has led to the following two research questions. The first one addresses the historic development prior to 1600 and how the location in a border region with Belgium has influenced the organization of water boards and water governance of the research area. Did the process of embanking and the development of water boards differ here from areas elsewhere in the Netherlands? The second question concentrates on how different the organization of water boards and water governance were at the end of the twentieth century compared with their start in 1600 and what kinds of developments must be held responsible for these differences. In order to answers these questions a wide range of developments has been studied, which is summarized below.

Chapter two describes how the landscape has developed from salt marshes and peat lands into a mosaic of embankments from 1000 AD onwards. The embanking was interrupted by storm surges and flooding (1375) and later on by intentional flooding during warfare. After the concluding of the Peace of Cadzand (1492) a 25 km long and new wall was built (Landtdyck in 1494) to prevent the flooding from extending further inland. During the 16th century the landscape was flooded for military reasons, mainly due to the Eighty Year’s War with Spain. As a consequence neither the medieval nor the 16th century landscape went through a gradual and linear development of embanking. Political stability and rising corn prices were the main incentives for venture capitalists to invest in re-embanking the area during the Twelve Year’s Truce (1609-1621) and after the Peace of Munster (1648). From the 1650s onwards, however, shortage of salt marshes and decreasing corn prices has resulted in a decrease of re-embanking, which demonstrates the dynamic interaction between natural and human factors that determined landscape change. Due to the low corn prices, the spending on dike maintenance was often curtailed by the water boards and the embanked areas (polders) became exposed to flooding during storm surges. The storm surges of 1682, 1715 and 1808 caused huge damage across Zealand and western North Brabant.

The tidal channel of the Axelse Gat was remained open for a long time as a line of defense in case of war. When the area has lost its strategic interest it was embanked (Beoosten- and Bewestenblijpolder). However, by the end of the 18th century locks were built to take water in during times of war. Strategic inundations did not have a great impact in other parts of the Netherlands as they had here. During the French Period (1795-1813) a Flemish-French company was allowed to embank areas between Antwerp and the Braakman and to use salt marsh areas for 32 years. This novelty would never occur again in the area. The impact of the Western Scheldt and the Flemish hinterland made the difference for the area described in this thesis.

In Chapter three the history of the water boards and how they did function is described. The 1242 Charter of the Vier Ambachten was a first major step in legislating regional water governance, stating that neighboring polder areas were obliged to give aid in case of flooding. During the 16th century some polders temporary and voluntary cooperated in building secondary dikes. However, in 1494 the government compelled areas to maintain the Landtdyck. In 1576 again the government intervened in matters of dike maintenance and water governance of Terneuzen and its vicinity.
During the 17th century local water boards defined their own policy. At that time there was no threat of changing tidal channels in the Honte. In 1715, however, several small water boards were unable to carry out repairs caused by the flood. This left them with the options of abandonment of the polder or asking neighbouring polders or the government for financial aid. The last option proved to be most beneficial, because small polders could be preserved while the government continued to collect taxes. As the number of requests for financial aid of small polders grew, the provincial government issued a number of regulations which also aimed to stop misuse. This was leading to a growing provincial interference in matters of water governance and dike maintenance of these polders. The General Regulation, issued in 1791, summarizes all decrees on this matter. This again underlines the interest of the 1715 flooding and demonstrates how the interaction between nature and man has influenced matters of water governance.

In 1797 the French government tried to increase its range of influence on matters of water governance of ‘free’ polders through the support of ‘free’ water boards. Although this failed, the 1808 and 1809 storm surges inspired the government to try again by consulting all water boards. This was resulting in the Imperial Decree of 11 January 1811 that compelled polders to install a water board consisting of a chair (dijkgraaf), members (gezworenen) and a treasurer (ontvanger-griffier) guarding the interest of land owners. Cooperation of water boards on issues of drainage was also regulated by this decree. Through the Imperial Decree of 28 December 1811 the water boards got a more democratic character, and smaller landowners were allowed to vote in the general assembly of their polder. The decree also reduced the term of members of the executive water boards and specified their tasks. After the French Period these decrees were maintained, underlining their importance and how well they met the needs of that time in matters of water governance.

During the first half of the nineteenth century the provincial government gradually took over tasks of the water boards. This is demonstrated by the Regulation on the Administration of Water Boards in Zeeland (1841) and by the General Regulation for Water Boards (1973). An example is the deprivation of Belgian landowners of their right to vote; however, their opposition was successful. Because of the 1906 storm surge the provincial government inspected the secondary dikes and the water boards were compelled to raise these dikes. After the 1953 flooding again a change in regulations was made without serious protest of the boards (1954). They had become used to the provincial supervision and the fear of the flooding of 1953 functioned as a stimulus. During the 1920s the small scaled structure of water boards could not handle the drainage problems in the area of Hulst. Therefore the provincial government required an up-scaling by installing a new kind of water board: Suatieschap Hulster en Axeler Ambacht.

Since the Peace of Westphalia (1648) the new border was creating international polders, which had to abide the regulations of two national governments. Besides the so-called calamitous polders these international polders are part of the unique contribution of Zealand to the Dutch history of water governance.

In comparison with areas elsewhere in the Netherlands, large scale water boards in the study area were absent. The large water boards on the island of Schouwen, Rijnland, and North Holland mainly supervised on a distance. This could be counterproductive, as is seen in North Holland with the introduction of steam power which failed. Through the issue of regulations the provincial government of Zealand tried to reduce the power of ‘free’ water boards in the 18th century, which differs from the Netherlands in general. During the French Period one decree was issued for the island of Walcheren in which one chapter concerned the water boards of the island of Schouwen.

From the mid nineteenth century onwards the control of the provincial government with regard to the organization and functioning of water boards increased. Provincial governments were implemented by the 1848 Constitution to supervise the water boards. Nevertheless the past kept on dominating the world of water boards in our research area.

In the eastern part of the province of Gelderland water management became institutionalized in the late nineteenth century in order to stop the continuous problem of flooding. Although flooding events in the past did already led higher authorities to interfere with local or regional water boards, also recent floodings, such as in 1916 in Holland, contributed to create an integrated water board system. As a result the water board ‘Hoogheemraadschap Noordhollands Noorderkwartier’ was founded. A similar development is seen in the province of Zealand after 1953.
Chapter four deals with the impact of the 1953 flooding on the water boards. The many small water boards could not pay for the repairs needed and aid was given by the national government. This was reinforced by the Deltawet (1958) that introduced the so-called deltanorm for repairing existing dikes and building new ones. As maintenance had to be carried out by the local water boards, the many small boards were forced to merge into larger ones. In spite of expected protests against anticipated higher costs, the provincial government issued the abolishment of all existing ‘free’ water boards and the installment of larger new boards. As an example the canal Gent-Terneuzen is mentioned that has split up the area into the Waterschap Verenigde Braakmanpolders in the west and the Waterschap Axeler Ambacht to the east. It also gave rise to a new category of officials on the board. In 1977 the calamitous water boards also merged into the two new water boards. In 1970 the Wet Verontreiniging Oppervlakte Water (Water Treatment Legislation) came into effect. This legislation was also leading to one large water board, the ‘De Drie Ambachten’. New categories of officials were introduced in the board, with a decreasing influence of farmers as a result. The new Waterschapswet (1992) introduced three new categories of officials: tenants, inhabitants and those representing business; it further prescribed that water board elections should be held simultaneously to other public elections. On 1 January 1999 three water boards in Zealand Flanders finally merged into a new big one: the ‘Waterschap Zeeuws-Vlaanderen’.

Reorganization of water boards during the second half of the twentieth century also occurred elsewhere in the Netherlands, but was probably most prominent in Zealand. Key factor in this process has been the 1953 flooding, although Zealand Flanders suffered far less damage. After a second merge in 1980 and a third one in 1996 one new water board was installed for Zealand north of the Western Scheldt, the ‘Waterschap Zeeuwse Eilanden’.

Chapter five deals with the building of dikes. Dikes had to be built within six months in summer time and had to be finished by mid-autumn. This was performed by a huge labour force using spades and carts. Clay was used as the basic building material and extra protection was created by putting wicker mats on the sods. In the 18th century a new method of fixing sods was introduced by using a sledge-hammer. Later innovations introduced summer dikes (vercortingen). These dikes were built across very large embankments in order to reduce the damage in times of flooding. From the 19th century onwards stone was used, while shortly after 1900 concrete was applied in so-called Muralt walls that were put on top of the dikes. Since 1953 these walls became out of use. According to the deltanorm top levels of the dikes were defined and in Zealand Flanders this norm is fixed on 9.25 m +NAP (National Ordnance Datum) since the 1980s. Within 60 years the levels were raised by 250%.

At some locations the stability of the dikes was threatened by tidal currents. Until then groins were built perpendicular to the dike. By this and other innovations Rijkswaterstaat got the lead in the application of these science-based techniques. After the 1715 storm surge some dikes on the island of Schouwen have been fitted with horizontal parts in the seaside slope. These so-called plasbermen made the dikes more solid and less vulnerable for the overflow of and erosion by water at high tides. Also the use of sods and bundles of wicker to be fastened on the sea ward slope of sea walls became common practice. Furthermore rafts of wicker were positioned onto the weaker spots of banks, first roundish rafts, later on flat ones which proved to be successful.

Chapter six deals with water management and water treatment. Since 1600 the small number of locks grew along with the number of dikes. Initially locks were made of wood, but since the destructive woodborer was introduced in the area, locks were made of brick. Although this was more expensive, the maintenance of these locks was cheaper and they lasted longer.

Silting up of tidal channels made it more difficult for the most southern areas to drain on the Western Scheldt, Hellegat or Braakman. As a consequence, the lower parts of the embanked areas were frequently threatened by flooding. The strong flow of water coming from the Belgian hinterland made this worse. The construction of a lock (Moerspuipoldersluis) only temporarily solved these problems. Drainage became also hindered by the embankment of the larger part of the Axelse Gat. This resulted in the building of the Gent-Terneuzen canal (1825-1827) by the national government.
As this canal proved to be unable to serve shipping as well as drainage, two new drainage canals were built, the Oostelijke Rijkswaterleiding and Westelijke Rijkswaterleiding. At the same time vast parts of the uncultivated heath lands in Belgium were drained and reclaimed. The Oostelijke Rijkswaterleiding could not handle the huge increase in the flow of the drainage water coming from the Belgian hinterland and the threat of flooding continued. In 1934, in order to improve drainage conditions, the new water board ‘Suatieschap Hulster en Axeler Ambacht’ took over control of the drainage canal. Problems that arose at the Westelijke Rijkswaterleiding, could be solved in 1965 by the founding of the ‘Waterschap De verenigde Braakmanpolders’. Both this water board and the newly founded ‘Waterschap Axeler Ambacht’ (1965) in the eastern drainage area developed long term water management plans for sub regions. The drawing of these plans was largely subsidized by the national government. These plans proved to be effective and brought the long-lasting threat of flooding to an end.

In the 1980s, during dry summers, attention shifted towards the handling of water shortage in the southern sandy areas of Zuiddorpe and Koewacht. The problems were solved by the construction of dams with water gates. In order to enhance the efficiency of this system a network of measuring instruments was installed as well. As more water had to be handled, the distance towards the Braakman and Western Scheldt grew and the management of the polder water became more precise, international treaties had to be made between the Netherlands and Belgium. In the past arrangements on the issue of handling drainage water from the hinterland were made by the water boards themselves (suatiecontracten).

Elsewhere in the Netherlands more progress has been made by introducing new drainage technologies and enlarging drainage capacities. In the 1870s polder mills were substituted by steam pumping stations in the north of North Holland. In 1872 the first steam pumping station was built on Schouwen to be substituted by a diesel power in 1932. In 1929 a pumping station was built on Walcheren powered by electricity. In Easter Zealand Flanders a diesel pumping station was installed at Stopmeldijke.

In the research area the polders still managed for a long time to discharge water at low tide. The influx of polder water in de sluices is depending on the dimensions of the drainage canals. These need to be broad and deep and this also holds for the locks. When a pumping station is brought into operation, the drainage canals have to be adapted to the new capacity of discharge. Because of the reorganization of the water boards it was possible to build a pumping station at Othene in 1990. This station combined technology of a classic sluice with a pumping engine powered by electricity. At the same time the locks of masonry were substituted by concrete and the supervision on the maintenance of the hydraulic works was professionalized. The enacting of the Wet Verontreiniging Oppervlaktewateren (1970) led to the founding of the ‘Waterschap De Drie Ambachten’ and as a result of this a station for water treatment was put into operation in 1990 (RWZI).

Elsewhere in the Netherlands areas also faced drainage problems, mostly caused by interference of man with the natural conditions of the landscape. Human impact was mainly economy-driven. In Rijnland many new ‘mill-embankments’ significantly improved the drainage capacity from the 15th century onwards, but at the same time also increased the pressure on the Haarlemmermeer area as a vast retention area. As problems increased in the course of the 17th century, these new mill-embankments could only be made successful if vast quantities of water could be discharged in time, but gradual subsidence of surface level made things worse.

In the province of Groningen the switch over from pasture to arable land during the 18th century increased the need for improving drainage and discharge of water, which created the need for water management in neighboring areas. At the same time those switch over created drainage problems in the lower parts of the island of Walcheren. In the eastern part of the province of Gelderland the first Markewet (1809) became the starting point for large scale reclamations of waste lands, resulting in a bigger pressure on existing drainage capacity.

In our research area drainage problems had two reasons. One reason was the fast increase in the amount of water to be discharged from the Belgian hinterland. The second cause was the systematic embanking with an increase of the drainage network. A solution to the problem was found in building the canal Gent-Terneuzen as was described before. In eastern Gelderland a similar solution was found, but canal building was postponed, because no agreement on its double function (shipping and drainage) was reached. In this sandy part of the Netherlands drought occurs in a similar way as in the southern most areas and higher sections of Zuiddorpe-Koewacht. In both areas weirs were built to solve the drought problem which as such is not unique in the Netherlands.
In Chapter seven the role of landowners and water boards in the improvement of the road network is discussed. The landowners that bordered on a road were obliged to maintain it. Twice per year the roads were inspected by the water board. Shortly after 1800 inspection was carried out by the provincial governments. For the advance of road improvement the provincial government founded a Fund for Road Improvement in 1840. Given that many roads of the polders also had to be improved, the polders were obliged to contribute 0.35 guilders per hectare. Since the mid-19th century water boards and local governments were encouraged to improve their road network through interest free loans. As a result initiatives were taken to build a gravel road between Hulst and Sas van Gent in 1854. It was the first road of its kind in Zealand Flanders and was exploited as a toll road. Although many would follow, road improvement turned out to be a slow process, because of the high costs.

As transport of sugar beets proved to be ruinous to the improved roads, square pieces of rock (kassei) were used to create a more solid pavement. First of all the road between Westdorpe and Sas van Gent was rebuilt in this way over a length of 6.6 km in 1873. Mainly larger water boards followed and financed the new roads by long-term loans which were paid back in instalments through the raising of the land tax (geschot). ‘Kassei’ and gravel roads remained the dominant type of roads even after the Second World War. Because of the considerable costs the provincial government adopted the maintenance of a growing number of improved roads since the assessment of the Tertiary Road Plan in 1938.

At the end of the 19th century the first initiatives were taken in the Netherlands for land consolidation in order to end the piecemeal structure of the lots. In the long run these initiatives resulted in three land consolidation laws (1924, 1938 and 1954), the last one widening the scope from purely agricultural aims towards improving the development of areas in general. In 1985 the Rural Spatial Planning Act (Landinrichtingswet) broadened the scope even further. The response of landowners in the study area was very different. In the south eastern area the first initiatives for land consolidation date from the 1940s. In the western area landowners were less eager. It was not until the founding of the water board ‘De verenigde Braakmanpolders’ that the first initiative was taken (1967). After having made preparations for about a decade, the proposal was rejected due to rather unclear procedures.

Enthusiasm remained low after the merging of the two remaining water boards in 1982. Drainage and roads were already modernised. In fact landowners were only interested in redistributing lots and for that reason a concept of a merely administrative land consolidation (RAK) was embraced. This again was a novelty in the study area. The administrative land consolidation affected 9,000 hectares and was realised at very low costs. A special type of re-allotment aimed at re-allotting farmlands among private landowners. The initiative for this was also taken by private landowners who could apply for funding from the national government and for expertise. From 1950 until 1988 several re-allotments have been carried out as a kind of ‘blessing’ for farmers and rural inhabitants in order to improve agriculture in terms of yield and quality.

Finally in Chapter eighth, the objectives of this research is addressed by answering the two questions defined in Chapter one. The first one is about the way in which water boards were organized and have functioned from about 1600 onwards and how this has changed. Around 1600 the water boards were responsible for dike maintenance and water management of their polder. In nearly each polder a lock was built in order to drain fresh water. Maintenance of hydrological engineering works was made possible through a land tax, levied per hectare and paid by land owners. Maintenance of roads was carried out by those of whom the landed property of rented lands bordered on the road. Ongoing embankment increased the number of polders and water boards, most of them being small and therefore not always able to govern its own area. As is stated in the general introduction, the functioning of the water boards has been influenced by changes caused by both natural and human factor and processes. One such a natural factor are storm surges, another is the tidal impact of the Western Scheldt, in particular the erosive action in the tidal channels approaching the baseline of dikes. A third natural factor is soil composition which could be different from one location to another. The 1715 storm surge did the groundwork for provincial regulations of the water boards and the coming into being of the calamitous water boards.
The 1808 and 1809 storm surges laid the foundation of the Imperial Decrees of 1811 giving the national government more authority over the water boards and the 1953 storm surge marked the abolition of the ‘free’ water boards.

Concerning the human induced changes it may be stated that the process of embankment was mainly steered by the economy in terms of high corn prices which made the investment of huge capital profitable. In the long run the process of embankment was not linear and at some points in time it slowed down very strongly. Another human factor is in politics. In the second half of the 16th century the northern part of the research area rose in revolt against the king of Spain whereas the southern part remained loyal. For a long time the study area was threatened by warfare and political unsteadiness.

In 1648 the Peace Treaty of Munster concluded that nearly the entire research area would become part of the new Dutch Republic, except for a few embankments across which now ran the new frontier. This was the start of international embankments as a unique kind of water board in Dutch history of water boards and water management. These embankments have existed until 1965, only during the French Occupation (1795-1813) they were shortly re-united. When the national state of Belgium was founded in 1830 a new border line ran across these embankments and across areas that jointly drained through Dutch embankments towards the Western Scheldt. Because of the increasing amount of fresh water coming from the Belgian hinterland, international water treaties between Belgium and Netherlands were concluded aiming at the building of two long drainage canals (Rijkswaterleidingen).

The second sub question deals with the impact of the past and the location in a border area on the organization and functioning of water boards and how they have evolved. Are there differences noticeable with other areas in the Netherlands in these matters?

In matters of sea defence and the protection of the seaward banks there are hardly differences with other areas in Zealand. Compared with the eastern part of the province of Gelderland, the southernmost section of our area faced similar drought problems.

On matters of drainage and discharge of water the studied area is quite different. As the amount of polders grew, drainage became an ever growing issue. On one hand the Western Scheldt was confined to a smaller space, while on the other the length of the drainage network grew. As a result the distance the water had to flow from the Belgian hinterland towards the Western Scheldt increased. As the drainage areas were split up into a number of larger and smaller water boards, each of them having their own authority and interests, the problems could not be dealt with efficiently anymore. This has led to the government to interfere and after the independence of Belgian in 1830 it was necessary to solve this by an international water treaty. Next to the already mentioned storm surges, political change has also led to changes in the development of organization and functioning of the water boards in particular in water management and water governance.

The building of the Gent-Terneuzen canal and the Rijkswaterleidingen (main drainage canals) proved to be efficient for only a short time. Again interference by the government was needed to get the drainage problems of the area under control. Therefore the provincial government installed the water board ‘Suaiteschap Hulster en Axeler Ambacht’ (1934), compelling the water boards that joint to hand over part of their autonomy to this new board. Three decades later the 1953 storm surge hit the area and swept away the last remnants of the pretended autonomy and independency of the ‘free’ polders.

A major extension of tasks of water boards in the 1970s was sewage water treatment. It also led to the coming of new categories of members on the water board which until then had traditionally been the bastion of farmers.