

The medieval embankment process in the northern Dutch coastal area. A historical introduction

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I must say I am very honored that I am allowed to give you a lecture on the history of medieval water management in the North. After all, history has no top priority in the field of water engineering. So, to begin with I would like to thank the organizers of this conference for inviting me.

Introduction

It is a well-known saying, that whereas God created the earth, the Dutch created their own land by reclaiming it from the sea. The saying is not entirely without truth, but I would like two comments to it. The first is that most of the Dutch lands were not conquered on the sea but on the interior wilderness, since before Christ more than two thirds of the country were covered by impenetrable peat bogs. The second is that the coastal area, which was occupied by man already ages before the arrival of the Romans, was never thought of or planned by its inhabitants to be cut off from the sea. Floods were dreaded of course but – just as in the Nile delta – they were also welcomed because they brought in fertile layers of clay. Therefore, their first option to protect themselves was not to embank their lands but to raise their homesteads. The questions for us then are when, how and why the embankment process in all its phases, with its irreversible consequences started, and how it was interwoven with the other large scale interference with the landscape, i.e. that of the reclamation of the peat fens. In the last decades, archaeological research made clear that both movements had an early start in Roman times. Apparently, population growth forced men both to intensify the cultivation of the alluvial coastal zone by constructing low and small infield protection dikes, and to open up new space by reclaiming the edges of the hinter lying fens. Because of unfavorable climate conditions however, and because of the retreat of the Romans, it was not possible to master the situation. By consequence, the sea had to be handled with in the old way. The outside water more or less could still correct men's activity, by inundating the earliest cultivated peat lands and covering them with new layers of clay. So, the transformation of the natural landscape into the manmade Dutch landscape of today could only made a begin with in Carolingian times.

Embankment history

It cannot be said that the history of embankment is a neglected field of interest. Ever since the seventeenth century, scholars in the diverse provinces have published on the origin of the landscape they were familiar with. Especially in the first half of the 20th century, up to the 1950's individual historical geographers have been active to

date and describe the diking movement, relying mainly on scarce written sources and the reading of old maps and the ocular inspection of still existing dike structures. This was also the case for the northern coastal area of Friesland and Groningen with its continuation in the German province of Ost-Friesland. The discussion on the where and when of the start – had it been in the 10th, the 11th or the 12th century? -, had no clear results up till the 1980's. The outcomes for the different regions often contradicted each other. This can partly be explained by the impressionistic character of the research and in the lack of written sources. After all, there are no 'birthday papers' available for the genesis of dikes. Another reason for a certain standstill in research was that the embankment historians in those years had not enough insight in the dynamics of the peat reclamation movement and the way in which it could have influenced the necessity of dike construction in the coastal zone. In the meantime new techniques have been introduced, especially by archaeologists and soil experts. In Schleswig-Holstein for instance, and in West-Friesland some dikes were excavated by cutting them. In more recent years, new material came available in the form of digital soil and altitude maps. And in the historical field, progress could and can be made with the retrospective property reconstruction for the medieval lords and institutions who were supposed to have played an important role in the embankment process. Therefore, there are interesting perspectives by now, also for the northern coastal area with its specific characteristics, to start with new research. This research has of course to combine the diverse disciplines and make their students work together, confronting their results with one another. The Groningen center for Landscape History, the Archaeological Institute of Groningen University and the Fryske Akademy are planning such a project to start in the near future.

Questions

As for the general line that I would like both to question and to explain to you, it seems rewarding to focus on two areas near the city where we are conferencing right now: Groningen. My choice fell on the long inhabited clay area of Middag-Humsterland, to the Northwest, and the small hinterland peat-moor area of Roderwolde, that was interconnected with Middag because it had to discharge its water to the North. The first area I am familiar with because of my study of the reclamation activities of the Cistercian abbey of Aduard. It really is a beautiful and well preserved region that merits a visit if you still have some time left after the conference. The other area I have chosen, has been analyzed recently by Jeroen Zomer for his master's thesis on the phasing of the occupation. Probably, it will interest you the more, since a lot of you will visit Roderwolde this afternoon to be introduced to the new water management project that is realized there.

Geophysics and settlement before 800

Before zooming in however, let us first have a look at the entire coastal region. Traditional geophysical maps represent it as a zone of flat and fertile clay marshes along the sea, intersected by gullies and tidal streams, with a hinterland of sandy and

loamy soils, partly covered by peat around 800. As you see on the colored map made by the archaeologist Egge Knol in 1993, the peat coverage – which has disappeared for more than 95 percent in the course of the centuries – is considered to have been very large, reaching from the sea level coastal zone up to the Pleistocene Drenthe plateau. Looking closer at the marshland zone one discovers soon enough that it was composed of two elements: a series of comparatively small sandy clay ridges near the seaside, and basins of heavy clay, deficient of lime, as a top layer on a thick packet of peat that came to the surface further south, creeping up in thick cushions to the slopes of the Pleistocene hills. In both areas people had settled on artificially raised dwelling mounds, the so-called Terpen, Wierden, Wurte or Warfte. The older ones arose already in pre-Roman times on the ridges, the younger ones were erected in the basins in the early Middle Ages. Archaeological finds suggest that they were all densely populated around the year 800. The distribution maps composed by archaeologists, place name experts and pedologists all confirm this impression. The Dutch medievalist Slicher van Bath, counting the possible heads for the family farmsteads on the terps, speculated that population per square kilometer here must have been as dense as in the Seine basin near Paris at that time. This was the time of the famous Frisian maritime merchant activity, that could be combined with agriculture since it was possible to get the ships ashore near the homesteads via the tidal creeks. It was also the period of Christianization, the founding of the first churches and the incorporation of the Frisian lands into the Carolingian Empire.

The system of letting the sea doing its 'correcting job', so to speak, had as it consequence that in certain periods, as a result of one or more great storm surges, new tidal basins could develop. Like that of the Lauwers-Hunze-Reitdiep estuary northwest of Groningen which is thought to have come into being in the beginning of the eight century. By lack of sources it is difficult to say how damaging this series of events has been. It created in any case new stream patterns, which possibly made the drainage easier for some regions in the hinterland.

Phases in dike building

As for the moment when people in the marshland area north of Groningen started to raise quays and dikes, we have no fixed dates. It could be the eleventh or the early twelfth century. On the phasing of the process however, most embankment historians seem to agree with one another in general: At first, like it was done in Roman times, quays of barely one meter high were raised, as partial dikes, closing the smallest tidal creeks and leading the salt water sideways, just to keep it out in the summer. At second, these dikes were connected. In this way, partial embankments could be encircled or enclosed, depending on the local situation. In some areas, this led to the development of island-polders. As people were not capable to dam of the major creeks, the quays were often running along the streams. Long time they still were only meant to give protection against summer floods. Simple outlets in the form of hollowed trees had to ensure that superfluous water could be discharged. In a third phase then, these dikes were heightened and raised to one and a half or sometime

to two meters, as to protect men and land behind them against winter floods. Yet, these embankments still could not prevent that the fields became inundated by storm surges, The dikes had mild slopes, so that the waves could do limited damage. Only in later phase people could develop plans for leaving the top of the dwelling mounds, moving the farms to their slopes or even to give each of them a new place on the flat surface amidst the pasture land. This meant among others that firmer valve locks in combination with feeding channels had to be constructed to get rid of the rain and seepage water.

The embankment of Middag

When we take a look at the altitude map of Middag-Humsterland, it is possible to discern at least two island polders of the second and third phases. Middag, like its name suggest already – age / oge / ey (like Schiermonnikoog) -, was a sort of half isle or peninsula in itself, bordered by different streams: the Reitdiep or Hunze in the North and East, and through the Kliefsloot in the West. In its centre a strongly meandering stream can be discovered, the Middagster Riet, through which long before the year 1000 the hinterland areas of Northwest-Drenthe could discharge its superfluous water, even before the Hunze-Reitdiep system had come into being. The inhabitants of this region, living on age old mounds like that of Ezinge, must have made collective arrangements on the encirclement of the whole, containing the erection of quays alongside the named streams and building a connection dike in the south. This meant also that the Middagster Riet had to be cut at both ends, through which it was deprived from its discharge function for the villages and hamlets more to the south. By consequence the draining of the hinterland had to be taken over by side streams that led the water into the Hunze in the east and into the Kliefsloot in the west. For the isle of Humsterland to the west, the same story can be told.

One of the major problems that resulted from this protection structure is that not only the arable and pasture land was encircled and shut off from the outside water, but that the streams themselves were more or less enclosed with their channels. The accommodation space was diminished strongly, which created extra dangers for the hinterland in case of storm surges, when water was driven up extra high through the tunnel effect. On the other hand the outside water could now only leave its deposits in its narrowed streambed, thereby speeding up the accretion process here and creating new differences in altitude. After some decades the isles thus became low lying polders that had increasing difficulties with the outlet of their own superfluous water. As far as I can see, these developments must have taken place before the Cistercian monks arrived here in 1192 to build a monastery at what seems to have been a small mound, called Aduard, just southwest of the circular Middag embankment.

Monasteries and reclamation

Of old, monasteries are said to have played an important role in the great European reclamation movement of the high Middle Ages. Especially the Cistercians and

Premonstratensians have a reputation of having been pioneer monks, since they preferred to establish their settlements in the wilderness, far away from the sinful world, living from the work of their own hands. As if they were repeating Gods creation, of course under his blessed guidance. At least, that was the story the monks told their benefactors. They wanted to be known as ascetic and austere living religious, because that would attract money for prayers. As we all know that advertisement and reality do seldom meet, a lot of modern scholars – including myself – have long time been skeptical on the real achievements of the Cistercians and other monks in this field. Looking at the sites of the more than hundred monasteries that were founded in the Frisian coastal area between 1150 and 1350, it strikes for instance that they nearly all were built on terpen, on mounds in regions that were cultivated since long. Nevertheless, the retrospective reconstruction of their property and their exploitation units – which could be realized for the provinces of Friesland and Groningen in the last decades, even in a parcel based GIS – gives reason enough to positively reassess their role as transformers of the landscape.

Aduard and its start

As for the abbey of Aduard, we know that it quickly acquired the lands in the immediate surroundings of its buildings, both to the east as to the north, thus partially on the embanked territory of Middag. That is where the monks erected their first large model farms or granges, the ‘old’ Aduard voorwerk and the Fransumer voorwerk. When we pose the question as to what they did to improve the drainage of these abbey and grange lands, and those of their neighbors to the south, it may be clear from the altitude map that they have tried in several phases to lead it to newly created locks in the dikes along the major tidal stream the Kliefsloot. Taking 1192 as the *date postquam*, these must have been constructed in the early decades of the thirteenth century. The places of these outlets can be identified by the difference in altitude at both sides of the dike where it is touched by a water course, being the result of the silting up near the lock. The construction of a dam in the Kliefsloot may have offered a better protection against inundations, but it also must have speeded up the accretion of clay before the lock, so that it had to be moved not just once but several times. It cannot have been easy for the Cistercians to keep the streams moving through their complex for both the supply of fresh water and for sewage purposes. In the second half of the thirteenth century – as we know by recent finds – they would come up with a perfect and definitive solution. But before I reveal you that, we have to turn our attention to the developments that had taken place long time before, in the peat-moor district some ten kilometers south of the abbey.

The reclamation of Roderwolde

On the Pleistocene map the Roderwolde district can clear be pointed to as lying in an old meltwater vale of the Drenthe plateau. An interpretation of hundreds of boring samples shows that long before Christ a cushion of sphagnum peat had been formed there, just between two small brooks that came together in the north, following their

route to the tidal gullies near Aduard or in the Hunze, to the east. A classical horseshoe peat bog, a few meters high in the centre, with reed and sedge peats at the edges near the rivulets. The reclamation of this area must have started at least in the middle of the eleventh century. Possibly earlier, since it is known that the church of Roderwolde as an institution already existed around 1050. It was a communal planned enterprise, with lengthy strips of land parceled out from the beginning and allotted to individual farmers, apart then from the church and the parish minister for whom a broad strip was reserved at the same time. The strips were not demarcated and delimited in depth in advance. Like in other Frisian territories, unlike the situation in the Holland-Utrecht plain, the colonists had an unrestricted right of stretching their land further into the moor, though at some distance they dug a transverse canal to catch the seeping peat water from the cushion. The axis from which the colonists began their labor, draining the soil to make it suitable for the production of rye and barley, was the zone along the bifurcation of the two brooks. The primitive farmsteads do not seem to have stood neatly on a row. This type of colonist settlement with its typical honeycomb structure of canals, transverse roads and straight linear ditches are found everywhere in the extensive peat zones of south Friesland and Groningen. Longtime it was thought that their start had to be dated after the first millennium. But archaeological findings of the last decades suggest that in the edges of the peat area bordering the clay-on-peat zone, some projects did already commence in the ninth or tenth century. In any case the Roderwolde undertaking belongs to the earlier ones.

What is clear from the research of Jeroen Zomer, and what makes it that interesting within our framework, is that at some point in time the colonists were confronted with inundations and flooding from tidal streams coming in from the north. This can be concluded from the thin layers of clay that has been found here, with an out wedging thickness of not more than 30 cm, and that covered the already compacted soil at their starting zone. Possibly, the subsidence of the soil as the result of drainage and oxidation has provoked these inundation at a time when the major tidal streams on both sides of the isle of Middag had not been dammed yet. So this event must have taken place in the course of the twelfth century, before the arrival of the Cistercian monks. As far as can be seen, this did force the Roderwolde colonists to move their farms further up the slope of the peat cushion. It is possible that the occupation was temporarily interrupted, although this is difficult to detect. In any case the event or series of events must have had some impact, since it changed the property structure here. When the farmers returned and took up the reclamation labor again they left behind a complex that did not belong to them anymore.

The Hoogheem grange

This is the second interesting result of Zomers analysis. In the area that had been flooded and transformed into a clay-on-peat landscape, shortly after 1250 a grange was built of a Cistercian monastery. It was a grange that belonged to the nunnery of Marienkamp, that was founded near Coevorden around 1230 but had to be moved to

Assen in the North of Drenthe in 1248. It can be figured out that it encompassed two hundred acres of land lying in a perfect rectangular block immediately south of the grange. The site and part of the buildings of this grange have been investigated by archaeologists of the city of Groningen about six or five years ago, because of the construction of a new industrial zone at the west side of the town. Their results have not been published yet. But the preliminary reports make it clear that the grange has been built from scratch. The lay brothers who constructed it first made a platform of clay, measuring 50 x 40 meters, which they subsequently extended by digging a moat around both the platform and an adjacent plot through which a separated space was formed of 100 x 50 meters. At first sight it is puzzling that such a structure was made for a nunnery, since monasteries for women are not known for the active way in which they managed and exploited their property. But the situation becomes explicable when it is realized that the moving or migration of the Cistercian nuns, from Coevorden to Assen was carried out under the guidance of the abbot of Aduard. For he was their father abbot at the time. So it looks as if the grange has been built by brothers of Aduard, be it as an Aduard property, to be sold or transferred to the nuns. Or be it in assignment of the nuns, after these had acquired the abandoned property in some other way. The first possibility though seems the most probable in my opinion. For the location of the lands belonging to this so-called *Hoogheem* grange, nearly dovetails to the large core complex of Aduard lying on the more fertile clay lands to the north.

The later phases of the Roderwolde reclamation

As for the next phases of the Roderwolde peat reclamation, it has been shown that this followed the usual pattern in the 14th and 15th centuries. The migration process was continued. The farms were relocated several times up to the recently reclaimed peat-moor, reassigning their drenched fields as pastures and meadows. As a result of the prolonged cultivation for arable even the last peat subsided until around 1500 some farmsteads landed on the sandy Pleistocene subsoil.

Aduard and the Aduarder Diep

The data on the Roderwolde grange, the direct exploitation of which, by the way was given up by the nuns after the middle of the fourteenth century, lead us back to the water management problems of the Aduard abbey a century earlier. The reconstruction of all the property of the monks, via later administrative records concerning the monastic lands that had been confiscated by the Province authorities after the dissolution of the monasteries at the end of the sixteenth century, demonstrate that the Cistercians had great interest in a well functioning draining system. Especially for the large areas of clay-on-peat land southeast of the abbey complex. But also for their new granges on the silted up clay ridges at both sides of the Reitdiep in the North.

When we take another look at the already presented map concerning the embankments and streams in Middag, I would like to draw your attention to the linear drainage canal, known as the Aduarder diep, that runs south to north, ending up at Aduarder zijk in an outer bend of the tidal stream of the Reitdiep. Zijk means sluice or lock. Until quite recently, it was thought on the basis of a charter from the beginning of the fifteenth century that its construction only started around 1400. This has always been a riddle to me, because it is very clearly established that the abbey like most monasteries in Europe at the time lost a lot of its capacity to exploit its lands by its own monks since the middle of the fourteenth century. In fact its force of lay brothers and working monks was decimated by the Black Death and several other disasters, never to recover in later periods. The result of which was that the abbot had to rent out most of his 6.000 hectares of land to tenants. At the same time he had to cope with serious economic and financial problems. Which means that around 1400 his interest in active participation in major drainage projects cannot have been as great as a century before. Now, to my surprise, recent archaeological investigations of the wooden pile foundation of a medieval bridge across the canal has as an outcome that it was not constructed around 1400, but already ca. 1275. Exactly, in the period thus that the monks were still very active in water management. This really makes sense! It means that by digging this canal in this period they succeeded in overcoming the silting up problems near the first outlets they had made in their immediate surroundings. It offered a definitive solution, not only for the drainage problems they had themselves but also for those of the landowners in the sand and peat districts to the south, the village community of Roderwolde for instance, or the nuns of Assen. A splendid piece of medieval water engineering, I would say.

The case of Aduard might seem to have been a unique one. But that was certainly not the case. A reconstruction of both the monastic properties and the drainage systems and locks in the silted up Fivel estuary more to the northeast of Groningen demonstrates that there too, lay brothers on granges, belonging to different religious houses which not even belonged to the Cistercian order, had an active role in the damming the major streams and the improvement of the water drainage for the whole of the region. In several parts of Friesland west of the Lauwers the same constellation can be found.

One of the conclusions from the foregoing is that the period of active engineering by the monks ended in the second half of the fourteenth century. Thereafter, their abbots and priors still played their role as chairmen of the water boards, being in person the major landlords. After all, together they owned 15 to 25 percent of the cultivated lands in Friesland and Groningen, probably also in the German Landschaft of Ostfriesland. As for the peat districts, the monasteries nearly had no properties there. Because most peat districts however discharged their water via drainage canals through the northerly clay zones, the dikes and dams there also offered their inhabitants protection against great storm surges and floods. Their lands were more vulnerable of course than the now embanked terpen districts, firstly because the soil

was far less solid and could easily be eroded by flood currents. And secondly because the compaction of its surface created large basins of low lying land, provoking so to speak prolonged inundations when seawater found its way in. Correction by renewed accretion through the sea was made impossible by the damming up of the tide gullies downstream.

Especially those peat districts were vulnerable that directly bordered to the sea or had only a small dike zone with low embankments to keep the salt water out. When in exceptionally severe surges these dikes did give in, the disaster was enormous and the damage irreparable. Like the grosse Manndränke in Nord-Friesland at the coast of Schleswig-Holstein in 1362. Or the breaking in of the Dollard region, east of Groningen, in phases at the end of the fifteenth century. The latter drama shows that it was impossible to close the dikes again. The Dollard had become a same sort of bathtub like the Grote Waard in South Holland, which was drowned by the St. Elisabeth flood in 1421. However, it could be reclaimed in the following centuries as clay polder land, being the result of a silting up process. Polderland which was ten times as fertile as the former peat soils. Should we call it a later blessing in disguise?

Conclusion