17 RECONSTRUCTING DISAPPEARED LANDSCAPES OF WET AREAS: THE WESTERN SEALAND FLANDERS

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INTRODUCTION

Coastal landscapes show very specific characteristics since the sea and the water of the tidal channels mainly influenced their origins. The upper layers of soil are quite young, most of them are formed in the course of the Holocene period and consist mainly of alternations of clay, peat beds and sand deposits.

Studying the historical geography and settlement history of these areas one encounters very specific problems. On the one hand, in many areas the settlement patterns and field patterns have completely changed; at times this was caused by renewed tidal influence and new marine deposits. In other areas environmental pressure generated new social relations, which engendered major changes as well.

On the other hand, at least for the medieval period, the same areas offer major possibilities to be studied and even at times allow to a certain extent for better reconstructions to be made than is the case for many other landscapes in areas that did not develop under marine influence.

This paper will present some preliminary results of an interdisciplinary project that focuses on the reconstruction of medieval landscapes in the coastal area of medieval Flanders.[1] It will especially highlight the difficulties as well as the possibilities of reconstructing disappeared medieval landscapes. The test area is an area in which the medieval landscape was largely lost: Western Sealand Flanders on the south-western

[1] The project presented here is '*Lost cultural landscapes in the border area of Flanders and the Netherlands*' (Supervisors-spokesmen: Prof. Erik Thoen (Ghent University, Department of Medieval History) and Prof. Jelier Vervloet (Wageningen University & Research, Department Socio-Spatial Analysis Group); Supervisors: Prof. Emeritus Hugo Thoen (Ghent University), Prof. Emeritus Peter Henderikx (Amsterdam University UvA), Prof. Marc Antrop (Ghent University), Prof. Philippe De Maeyer (Ghent University), Prof. Johnny de Meulemeester (Ghent University), Robert van Dierendonck (Stichting Cultureel Erfgoed Zeeland); Researchers and PhD-students: Geuch de Boer (Wageningen University & Research), Vanessa Gelorini (Ghent University), Alexander Lehouck (Wageningen University & Research and Ghent University), Nele Vanslembrouck (Ghent University), Tim Soens (Ghent University). The VNC-project (Flemisch-Dutch collaboration Project) is sponsored by the science foundations of Flanders (FWO) and the Netherlands (NWO), Wageningen University and Ghent University.

border of the Netherlands, close to Belgium. In the Medieval and part of the Early Modern Period it was situated in the northern part of the former county of Flanders, which was one of the most important principalities of the North Sea area in the high Middle Ages.

During the later Middle Ages and the 16th century, the old medieval landscape of the Flemish coastal plain was (again) heavily ravaged by marine influence. The flooding carried out for military reasons in the 1580s during the Religious Wars had especially wreaked havoc, putting large parts of the area under water for many decades. The result was a complete reorganisation of the infrastructure and field pattern during the 17th century when new embankments were established, even in areas that were not inundated. Within a few decades, the medieval landscape was completely reshaped. The challenge of the interdisciplinary project was to find out to which degree this medieval landscape could still be reconstructed.[2]

THE RECONSTRUCTION OF MEDIEVAL LANDSCAPES IN THE COASTAL AREA: SOME PROBLEMS

Dating the sediments and soils in marine environments

One of the major problems is to establish when marine deposits and peat bogs were formed and how long they lasted before they were covered by other sediments, if and when they changed in character by compression or when and how they were disrupted by human action. The clear image which one seemed to have of the evolutionary stages of the formation of the coastal plain in the recent period changed completely in the last decades. Contrary to what was believed for a long time, during the last two millennia, neither sea level changes nor the intensity of storm surges seem to have had an important impact on the formation of the coastal plain (which extends over an area from Northern France to Denmark, including the coastal parts of the Netherlands and Belgium).

Regional and local circumstances seem to have been much more important. Nonetheless, systematic and locally focused geomorphological and pedological research is still to be carried out to date the sediment layers and the (often disappeared) soils of the past which were affected by locally changing marine channels. This is a mayor handicap when interpreting archaeological finds and traces of human action.[3]

The human factor has been underestimated in the development of wet landscapes.

[2] A more developed version of certain methodological problems which are mentioned here can be found in Vanslembrouck, Lehouck & Thoen (2005). See also Vervloet & Thoen (2005).

[3] The term 'transgression period' for sedimentation stage has been abandoned. For the latest geological views on the origin of the coastal plain see: Weerts *et al.* (2005), Baeteman (1999) and Baeteman *et al.* (2002). Towards interaction of geological events and human occupation, see: Ervynck *et al.* (1999) and Vos & van Heeringen (1997). Important new data about the origin of the Flemish coastal plain based on a combination between archaeology and history are provided by the work of D. Tys: see for instance Tys (2004). His PhD-research (2003) will soon be published in a book form. For the period from the 12th century onwards see also the works of Thoen en Soens, especially Thoen and Soens (in press).

It may seem contradictory, but despite the confusion about the physical phenomena, most studies which were published about the coastal plain in the past decades still focus on these physical aspects and seem to neglect the human factor. Nevertheless, it seems clear that the human influence was very important. Human organisation not only influenced the cultural landscape but even the evolution of the physical landscape.

Many "apparent" physical processes were to a large extent influenced by human acts. The changes of the (former) peat (surface) layers by peat digging are evident. The scale of systematic peat digging activity for fuel provisioning and as basic material for salt production in the medieval period is still often much underestimated.[4] The peat compaction was often caused by "unnatural" drainage as well.[5] The lowered ground level as a consequence lessened the protection against the sea and the tidal channels.

But also the changes in the social organisation increased or decreased the possible impact of nature. Indeed, since the 10th but especially the 12th century arable land was protected by dikes. It may well be that these dikes did not serve the purpose of "conquering" "new land" - as was thought for a long time. Embankments had become necessary due to the improved marine influence that was caused by environmental problems such as the earlier described peat compaction process but also other phenomena such as the harmed coastal barrier of the dunes caused by over-pasturalism.[6] Moreover, these embankments had become necessary because an increasing number of inhabitants in the area stimulated the cultivation of cereals (*Vergetreidung*) to the detriment of cattle and sheep breeding. But dikes and locks had to be maintained well. Recent studies showed that the society was evolving towards structures that systematically undermined the good maintenance of dikes in the course of the 14-16th centuries. So, it is hardly a coincidence that this period was marked by a gradually increasing damage of the Scheldt area.[7] These problems were co-responsible for a new stage in the social organisation: the evolution towards an area with larger farms where cattle breeding became (again) more important. This evolution caused new geographical settlement patterns: scattered larger farms became more common and many smaller farmsteads were abandoned.[8]

In sum: it is absolutely necessary that the functioning of the society is taken into account to understand major changes in the landscape.[9]

Archaeological deficiencies

Up to now, on the archaeological level, the existing studies and inventories have proved insufficient for several reasons. First of all, many former settlements are currently hidden by marine sediments. So, classical field walking often gives no or only little

[4] See e.g. Augustyn & Thoen (1987) and Soens (2002).
[5] Fockema Andreae (1950).
[6] Augustyn (1992 and 1995).
[7] With many losses of land as a consequence especially during the storm surges of 1375-76 and later when in the Scheldt mouth many islands disappeared and large tidal channels such as the Braakman were created.
[8] Thoen (2001 and 2004).
[9] See for the Modern Period also: de Kraker (1997).

information. As a consequence, we possess little knowledge of archaeological remains in our study area of the period prior to the military inundations. Secondly, the existing inventories of the archaeological knowledge present us merely with scattered and indirect data. Contextual information and significance are mostly lacking. The attention paid to it is limited since many researchers considered the landscape as eternally lost. Many studies are insufficient because they do not focus on the entire context of the cultural landscape. Indeed, not only is the social context often neglected, as we already mentioned, but in many studies the former material culture is only partly studied and the landscape is mostly even not considered as an essential part of it. Few studies are really interested in the infrastructure, the settlement structure and the field systems together, although they are all three the basic elements through which a cultural landscape is formed.

Interdisciplinary methods are still underdeveloped

Although the term "historical geography" itself implicates multidisciplinarity, real interdisciplinary work is still scarce in this field. Especially the link between historical reconstruction and the current landscape is mostly poorly drawn. Mapping data was not the goal. However one is more and more convinced that the projection of older landscapes on the new ones is useful to adjust the interpretations of historical data. Below we will demonstrate that this is even true in landscapes where at first sight the medieval traces are "drawn" under newer sedimentation. Combining data can even result in better assessments of those landscapes.

THE RECONSTRUCTION OF MEDIEVAL LANDSCAPES IN THE COASTAL AREA: SOME POSSIBILITIES

Many historical sources are available which allow a systematic analysis with modern techniques

Since the 13th century, public institutions were responsible for maintaining the infrastructure such as dikes, waterways and locks (the so-called *wateringen*).[10] These institutions left a huge amount of written administrative information which is quite well-conserved. The levy of taxes on the property holders who owned land between the dikes gave birth to a very interesting series of early cadastral sources. These tax registers are called *ommelopers* in Old Dutch, or water board registers, and date back to the 15th and 16th centuries. Despite the fact that before the 17th century they are usually not accompanied by maps, their advantage is that they provide very detailed topographical information, which allow for topographical reconstructions, sometimes even on the level of the parcels. These reconstructions are very time consuming, but since we dispose of computers and computer programmes to process the enormous amount of data, these reconstructions have become possible.

[10] For the most recent theory about the origin of the Flemish water boards: Soens (2001 & 2006).

Moreover, the management of the land by the numerous large landowners in these areas was often organised in a much more "modern" way than the landowners did with identical land in "more traditional" areas.[11] The result is once more an abundant amount of sources such as domanial accounts and land registers which are often conserved in a serial way. The combination of the data of these documents with the administration of the water board registers in the digital data bank enables a retrogressive interpretation of the landscape until the 12th and 14th centuries, in some cases even on the level of the individual parcel.

If we succeed in "linking" the data of the data bank with the archaeological traces and adjacent techniques (see below), it is even possible to (sometimes hypothetically) reconstruct the former parcels, settlement patterns and infrastructure elements on current topographical maps. Up to now, reconstructions of this kind were extremely rare, but can help to bring former landscapes back alive even when they are completely transformed by flooding or extreme land reorganisations as was the case in our study area. Indeed, for large areas, such as the district illustrated in Fig. 1, it was possible to reconstruct the late medieval field pattern by "warping" onto the topographical map in a GIS-environment (see also below).

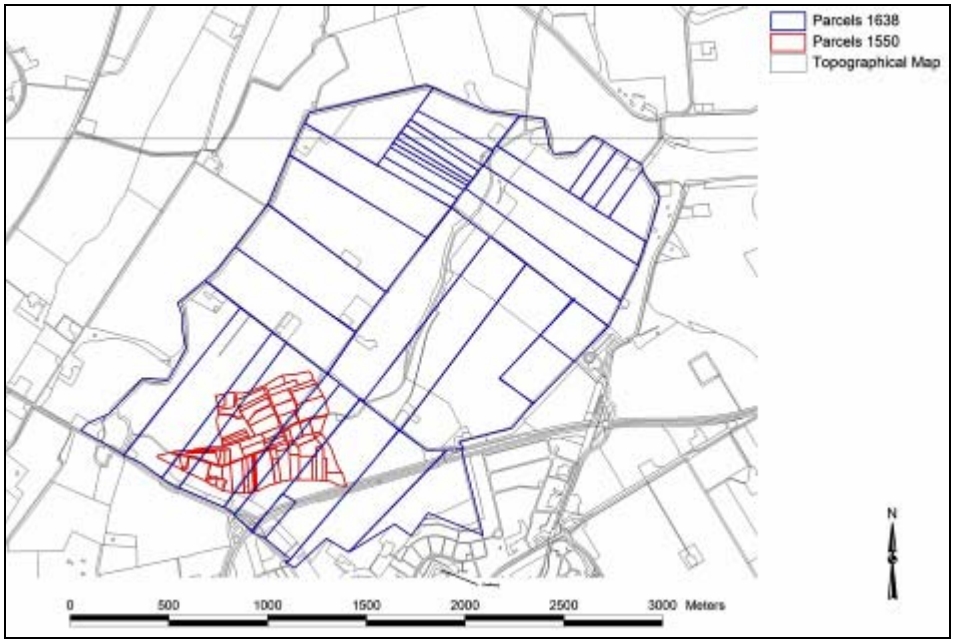

Figure 1: The "medieval" field pattern reconstructed with a land register of 1550 (small parcels in the S.E. part of the map) and the parcellisation during the re-embankment in the 17th century. It is clear that the irregular small plots were replaced by larger parcels which were even shaped in a different direction.

[11] E.g., lease holding developed in a much faster and more complete way in these areas since the late 13th century; see Thoen and Soens (in press).

A comparison with 17th maps, for this period quite exact and with the individual parcels depicted, shows that the field patterns had changed completely after the re-embankments of the 17th century. The Fig. depicts both the reconstruction of the medieval cultural landscape and the re-embanked parcels (indicated as "parcels 1638"), integrated in a new infrastructure system: the Early Modern *Grote Hendrikuspolder* near Oostburg. As the whole area of that 17th century polder consisted of 647 parcels in 1550, the re-embanked landscape in 1638 was only divided into 37 lots. The district, reconstructed in the Fig., contained 73 parcels in 1550, which were re-embanked into only four parcels in 1638.

Without comparing the written data with archaeological and geographical data and the use of rather complicated electronic data banks and GIS systems, such reconstructions would not have been possible.

Data of landscape history are better integrated in the social historical context

For a long time the economic and social history of the coastal area was hardly studied and when it was, it was seldom compared to the material culture of that time and *vice versa*. This has changed more and more in the last decades. We now have better understanding of the social relations in medieval times, thanks to new systematic research of the sources. This research allows us to describe better the local production system ("social agro-system") of the coastal area as well as its evolution.[12] Indeed, we are convinced that the ways in which peasants lived and produced was locally determined.

We know that the coastal area (including our study area) evolved in the 12-13th centuries towards a quite well populated area in which smaller peasants who mainly produced for the survival of their family became the most common social strata. The result was a gradual *Vergetreidung* process in which sheep and cattle breeding, so important in the previous period, became less important. In the late 14th up until the 16th century this production system changed. Smaller peasants became less common and often suffered from bankruptcy which ensued in the loss of their land; the larger and mid-sized farmers who could profit from this evolution thus became the most important group in the coastal society. Agriculture changed once more and cattle breeding became more important (again). This, of course, had also important consequences for the landscape organisation. Grazing land became more common, holdings became larger and many smaller farmsteads were abandoned. Anyway, in this context, our analysis allows us to draw an important comparison between the evolution of the material culture and the social organisation. Indeed, the confrontation between archaeological data and historical data reveals that there was clearly a time-lag between the evolution of the cultural landscape and the economic and social reality. As we mentioned above,

[12] About the definition of 'social agro-systems', see Thoen (2004) and about the social agro-system in the coastal area, see Thoen (2004) and Thoen & Soens (in press).

in 1550, when we dispose of the data bank based on the land register, the parcellization was still very extreme (see the high amount of small plots) and not yet measured up to the increasing average size of the holdings (not all plots had already turned into larger ones). Only in the 17th century, after the Religious Wars, was the landscape changed in accordance with the increasing commercial attitude, which had nevertheless its origins in the later Middle Ages.

But there are many other huge consequences of the changing social relations in the area: we mentioned already the disastrous and long-term consequences of the evolution for the maintenance of the dikes and consequently for the geography of the area as a whole.[13]

Modern archaeological, geophysical and archaeobotanical research on a local level opens up new perspectives for the study of coastal areas

During the last decades, not only historical methodology, but also the "archaeological" and pedological methods have much evolved. Contrary to what one thought up until a few years ago, a geo-archaeological survey through systematic augering on a local level and partly inspired by the historical data makes it possible to reconstruct part of the medieval topography. One just needs some recognisable "anchors" or reference points in the landscape to help in dating features and stratigraphy.

Even in our greatly transformed landscape, association with the current topographical situation could show some continuity in the landscape such as some still functional medieval waterways, which were former marine channels (probably dating back to the early Middle Ages).

With the aid of an intensive analysis of aerial photographs an enormous amount of the medieval infrastructure could be traced. So, many old roads, dikes, ridges, channels, settlements and even parcels could be identified in our study area.[14] Already in the 1980s the importance of aerial photography for the landscape reconstruction had been underlined for the coastal area in Flanders and the Netherlands. Anyway, attention especially focused on quite sensational lost settlements and villages.[15] A systematic analysis of all kinds of visible traces – most of them are crop marks and soil marks – which are compared to all kinds of other sources had not yet been carried out.[16]

A new digital technique is the systematic analysis of minimal elevation differences in the field, calculated and made an inventory of via a special aerial photographic technique. This "Digital Elevation Model" (DEM) has been available for strictly scientific goals only for a few years. In our study area we could use the DEM with a 5 by 5 meter grid. This technique enables us to see the same tracks discovered with aerial

[13] See above.
[14] About the possibilities of aerial photography in archaeology see most recently: Vermeulen & Antrop (2001); Bourgeois *et al.* (2002) and Bourgeois and Meganck (2005). It must be mentioned that applications on wet landscapes are limited.
[15] For our study area, see: Goldschmitz-Wielinga *et al.* (2004), 48-49.
[16] In our project vertical aerial photos of World War II (made by British and American armies) were used a well as oblique photos of Jacques Semey made by and for the impressive aerial photograph databank of Department of Archaeology of the Ghent University (collection director prof. J. Bourgeois).

photographs and to detect new features as well. To apply this technique, it is necessary to calculate the average altitude. Intensifying contrasts and computing shadows, one can increase the visibility of the traces (for a general view on a large scale of the traces in the study area see Fig. 2).

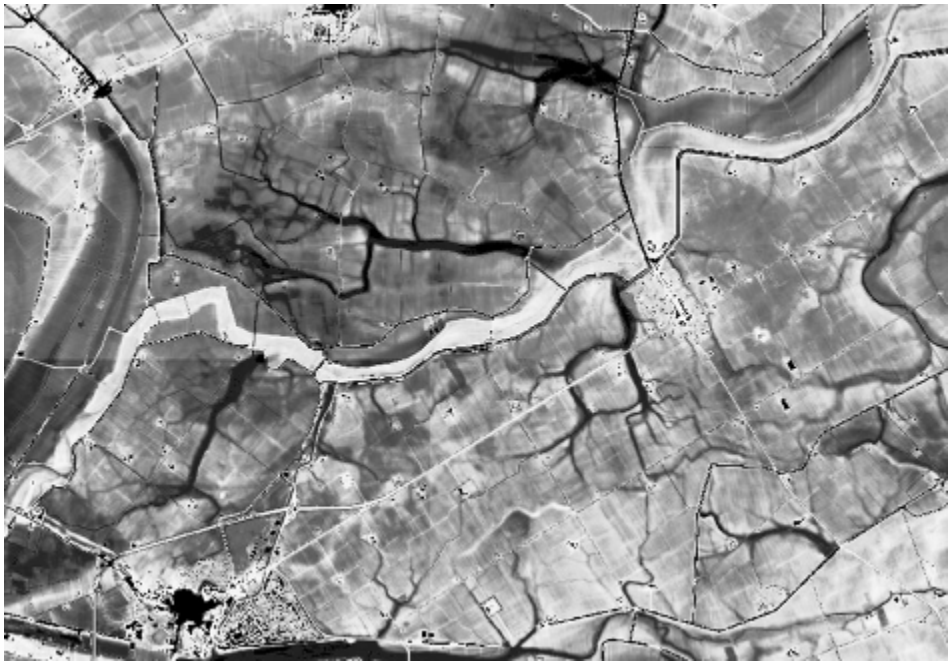

Figure 2: The area north of Oostburg (Zeeland Flanders) processed with the Digital Elevation Model (1996-2003), made by aid of remote sensing techniques (source: Adviesdienst Geo-informatie en ICT Rijkswaterstaat) which indicates the minimal elevation differences.

Quite surprising and apparently contradictory is the large amount of traces which could be discovered with the DEM technique and the aerial photos. It seems to prove that wet landscapes have specific reconstructing possibilites, even when part of them are later covered with new sediments. The nature of the landscape itself also creates new investigation possibilities. So, the post and late medieval instances of "flooding" "fossilised" certain infrastructure elements. Former roads e.g., with adjacent wide ditches were often localised on old channels or were sometimes reshaped into channels with strange unnaturally straight patterns and therefore often left clear traces. Also former patterns of old channels which were later covered with new sediments can often clearly be traced via the DEM technique. The same is true for old borders of parcels or parcel divisions.[17]

In sum, flooding and sedimentation did not completely erase the traces of ancient wet landscapes. On the contrary, in the long term they conserved certain tracks even better

[17] Since tidal channels are later often filled with more sandy sediments and since they had no under layer of peat, these channels were less vulnerable for compaction and eventually often were lying slightly higher that the surrounding surface level.

than could be expected. It does not need any further explanation that flooding and sedimentation could well conserve archaeological traces under the ground level,[18] but it was, at the start of this project, certainly more surprising that the still visible remains on the ground level could reveal in these kind of areas such an amount of new material about the material culture of the past.

Obviously, the information gathered needs to be compared to the historical data as well as to the information of old maps. Here we can mention another advantage of the "Flemish" coastal areas to reconstruct the medieval cultural landscape. Indeed, a large amount of early and well-preserved maps of the area that were made by land surveyors exist. The physical conditions of this area as well as the mentioned "progressive" management of the demesnes of the large landowners, made it necessary to map the area quite well and from an early stage onwards. This way, a large part of the coastal area – our test area included- was depicted on a huge map which dates back to 1570 and which can be considered as one of the oldest "topographical" maps in the world.[19] New digital techniques allow to "warp" (*i.e.*, mapping the incorrectly localised data of elder maps on the exact degrees of latitude and longitude of current maps) the data of the older maps on the current topographical maps. This way the information is increased and allows for better interpretations to be made.

As we mentioned before, one of the major problems up to now is the inexact geomorphological information to date the sediments and soils. Current soil maps do not allow exact dating of the layers. Therefore a new systematic augering on a micro-level is necessary to explain the physical phenomena in a parallel way with the above-mentioned systematic augering with specific archaeological goals, although both cannot of course be separated artificially. It will increase our understanding of the natural processes that took place via the tidal channels and will make us better understand the erosion and sedimentation processes as well as the interaction between natural and cultural processes.

Finally, it hardly needs to be stated that the archaeological, physical geographical and historical data can be compared with archaeobotanical investigations (pollen and macrobotanical analyses, study of phytoliths) to improve the knowledge of the former medieval landscapes in the area. As peat is an excellent context for this kind of analyses, the coastal area presents us once again with many opportunities of study. Furthermore, archaeobotanical research on archaeological and natural features (such as ditches, pits and channels) can provide some interesting insights into former landscape evolutions and land use patterns. This can be done through techniques whose advantages and importance have been soundly expounded on in this paper.

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[18] See e.g. the large amount of prehistoric traces which were preserved in Verrebroek – a village which borders our study area) under large layers of peat and clay: see Crombé (2005).

[19] The 'Grote Kaart' painted by Pieter Pourbus studied in van der Herten (1998).

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