The City and the River.
The early medieval Emporium (trade centre) of Dorestad; integrating physical geography with archaeological data in changing environments.

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Abstract: The location of Dorestad on a high natural levee along a not so active branch of the Rhine in the central Rhine delta was perfect for trade. It was far enough from the coast to be safe from storm floods. The high levee also gave protection from the annual river floods. River connections with the Flemish, French and German hinterland were perfect. Other delta branches ensured safe connections to the Zeeland delta and the open Flemish coast all the way to Dover Straight to the south and to the open Frisian coast all the way to present Southern Denmark in the North. The dangerously closed coast of Holland without any safe shelter places for storms could thus be avoided by ships coming in both from the South and from the North. Although the branch of the Rhine was not very active in the heydays of Dorestad, the whole river system was very dynamic nonetheless. Excavations at Dorestad show that the harbour works of Dorestad were constantly adapted to the changing river. Archaeological evidence doesn’t give any clues on the active riverbed, and its influence on this early emporium. Combining modern geophysical research with archaeological data not only gives insight in the changing rivers, but also in the reasons why Dorestad could rise to its glory, and the possible reason for its demise. The demise of Dorestad gave room for later river towns as Tiel, Dordrecht and the IJssel cities.

Keywords: multi-disciplinary approach, data integration, urban history, Dorestad, GIS

Introduction
Roughly in the centre of modern day the Netherlands is the town of Wijk bij Duurstede. This now idyllic sleepy river town is situated on the banks of the river Lek, where the dead branch of the Oude Rijn River (the Old Rhine) branches off from the main channel. From the middle of the twentieth century onwards this late medieval town has known a rapid growth. Vast new residential areas were built outside its old walls, stretching north along the banks of the Oude Rijn.
During this expansion, archaeological excavations were carried out in front of the developments. This way an area of almost 70 hectares was excavated. The excavations showed that on the site of modern day Wijk bij Duurstede a huge settlement has existed, including extensive harbour installations. The site, and the several (sub) sites around it dates from the Roman period to the Middle Ages. The extensive harbour installations dated from the early medieval period. This early medieval site was identified as the then important city of Dorestad.
This paper will focus on this early medieval emporium (trade centre), its position in the early trade networks of Europe and its advantageous position in the central Dutch river system.

**Dorestad as a trade centre**

In the early middle ages an enormous amount of goods were being traded across Europe. From Sweden to Byzantium, everybody wanted to have the latest fashion, weapons but also (and mainly) the basic commodities like iron, copper, tin, zinc and lead, salt, furs, wood and wheat. Since these products where seldom available in one area together, a network of long distance trade was set up. Trading goods over great distances was not easy. The best method of transport was via water. Sea routes were by definition dangerous, and it was hard, if not impossible to navigate over open water not within the sight of land. Most transport, therefore, took place on the safer, inland, river routes. When you had to change from one river to
the next, preferably via the shortest distance overland, settlements could grow into transhipment centres. The same was true for those cities on bifurcations of rivers, or at the end of sea routes. This lead to the rise of the great Scandinavian emporia like Birka, Kaupang, Hedeby and Ribe, as well as the Saxon-English towns like Jorvik (York), Sutton, Hamwic and Ludenwic (London). All these towns were at the end of (coastal) sea routes with relatively save inland ports.

For the trade routes into the central European markets the recently formed Zuiderzee\(^1\) in the Netherlands offered a save passage from the northern and eastern North Sea and Baltic coastal routes to the Rhine river system. The English and French coastal routes could access this central European river system via the Meuse-Lek estuary. The Meuse also formed the link, via the Rhone, with the Mediterranean markets, while

\(^1\) Vos 2011
the Rhine-Danube system gave access to Germany and the Black Sea. Where all these routes met was, therefore, the ideal place for a huge, pan-European, transhipment centre.

The Geographia Ravennatis, a description of the places of the world, compiled around AD700 by an anonymous cleric in Ravenna, reports of such a town, “between the Franks, the Saxons and the Normans, in the area of the Frisians”, known as “Derostates” or “Dorestatus”. In 779 Charlemagne grants Dorestad its own tollage, a privilege that emphasises the importance of the town as a trade centre.

Fig. 3 – Distribution of Dorestad coinage over Europe.

2 Geography Ravennatis, 24
3 Dekker 1983, 31-38
This importance is even clearer by the fact that Dorestad had its own mint. From the seventh century AD the town had the right to produce its own coinage, the earliest by the master Madelinus. Until circa AD690 gold coins were minted, after that mainly silver “sceatta’s”. Later, in the Carolingian period, coins were minted with the names of Pepin the Short and Louis the Pious. The early Merovingian Madelinus coins have been found all over France, Northern Italy and as far as Russia.

Dorestad clearly was an important economic centre. Archaeological evidence can be found in the amount of imported pottery, glass, grindstones from the Eiffel region and Baltic amber. But there also was trade in Scandinavian whetstones, furs, textiles, pigments, salt, food and even slaves and hounds.4

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Fig. 4 – Provenance of wood trade in Dorestad. Yellow depicts indigenous oak from the Lower Rhine region and red the oak imported from the German Rhineland.

4 Dijkstra, van Doesburg & Sier 2007
Dorestad’s regional trade importance is underlined by recent research on wood provenance. Results indicate that Dorestad was part of a trade network along the North Sea coast that included agricultural settlements at Leeuwarden, Castricum, Katwijk, and Oegstgeest (NL), as well as Bruges (BE). The analysis of the common signal in growth patterns of oak stave and planks (mainly re-used wine barrels) excavated at these locations shows that this network had strong ties to the German Rhineland and probably were all dispersed through Dorestad. Local wood was also traded in Dorestad. Analyses showed a second timber group consisting of oak from the levees of the lower river Rhine, originating from agricultural settlements in and near the towns of Dordrecht, Katwijk, Leiderdorp, and Utrecht, proving the central role of Dorestad in both regional as supra-regional timber trade.

But Dorestad not only was a town of (long distance) traders: recent research shows that several of the premises were in use as workshop. A multitude of craftsmen produced articles like beads, combs, jewellery and bronze objects. Most of this production went into the international trade. The richly bejewelled golden fibula that was found during the excavations might, therefore, be locally produced. Its style and appearance link it to other well-known treasures like those from Sutton Hill or Staffordshire. It even bears some resemblance to the Casket of Teuderic. The Dorestad craftsmen certainly knew their techniques and height of fashion.

![Fig. 5 – Comparison of the Dorestad fibula (1) and the Dorestad – De Geer brooch fragment (2) with the Casket of Teuderic (3), the Hedeby brooch (4) and parts of the Staffordshire Hoard (5) shows a great similarity in style and techniques.](image)

The ever changing river

What gave a site like Dorestad the opportunity to grow that big, while its modern counterpart Wijk bij Duurstede never had any important role in (international) trade or politics? As stated above, Wijk bij

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Jansma/van Lanen 2013 (in prep).
Duurstede is situated on the north bank of the river Lek. This river nowadays forms one of the three drainage channels of the Dutch Rhine system that flow to sea. This Dutch Rhine system is in fact a river delta. The present three main branches bifurcate from the Rhine near the Dutch-German border.

The southern Waal branch now is the main drainage channel for the whole Rhine delta. A little downstream from the bifurcation of the Waal, on the northern (Dutch) Rhine the IJssel stream branches off near Arnhem, flowing north to the Zuiderzee-IJsselmeer. The remaining western river branch flows as the Rhine to Wijk bij Duurstede. Here a no longer functional branch took a northwesterly course. For a long time, this was the largest Rhine branch in the Delta. Its quiet remains are still is present; the Oude Rijn (Old Rhine). Nowadays, the remainder of this channel does not carry any water from the Rhine system, since it was dammed off at Wijk bij Duurstede in AD1122. This, of course, also has a dramatic effect on the river traffic; apart from the odd pleasure boat cruising to Utrecht and the Vecht River, the river has lost its economic purpose. After damming of the Old Rhine, the cities of Utrecht and, later, Amsterdam were connected to the Rhine by canals. The modern, straight Amsterdam-Rijnkanaal waterway was constructed in phases between 1892 and in 1952. This modern water infrastructure connects the ports of Rotterdam and Amsterdam directly with the German hinterland, and transhipment in river harbours is completely obsolete.

Since the Waal River is much larger and deeper than the Lek river, that has become the main shipping route. This gives Wijk bij Duurstede no role of any significance: no transhipment needed and not situated on the main traffic route.

The situation for Dorestad could not have been more different. Judging by the harbour works and the amount of trade goods found, the Rhine would have been the main shipping route during the rise of Dorestad. The flat, muddy plains of the central Netherlands gave the Rhine-branches lots of opportunities to change their course. They freely did so until their embankment in the 12th and 13th centuries. In 1982 the Utrecht Dr. H.J.A. Berendsen published in his PhD thesis his now famous map of changing Holocene Rhine channels in the south of the province of Utrecht. In 2001 Berendsen and Stouthamer synthesised 25 years of (PhD)research in their book on the channel morphology and chronology of the Rhine-Meuse delta. These publications gave an excellent overview of the age of all the several fossil channels that can be identified in the Rhine delta (over 100 individual channels!). This geological biography was supplemented in 2010 by Cohen with his publication of a map of sand deposits in the Dutch rivers and the new palaeogeographic reconstructions of Vos.

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Berendsen 1982  
Berendsen & Stouthamer 2001  
Cohen 2010  
Vos 2011, maps AD100 and AD800
Finally, in 2012, Cohen et al. published a revised edition of the Berendsen and Stouthamer map. All this work has resulted in good maps and chronology over the Rhine delta as a whole.

Fig. 6 – The location of Wijk bij Duurstede in relation to the main waterways.

Complementary as these studies are, for making a period map of the area of Dorestad there was a problem. The Berendsen map of 1982 stopped at the Lek River, and therefore excludes the older channels south of the modern river. The Cohen map of 2010 also stopped at the Lek River, but uses it as its northern border. The Berendsen and Stouthamer mapping did include the whole area, but is mainly focused on identifying and dating the several (fossil) channels and not so much on detailed palaeogeography. In order to get a full picture of the local area around Dorestad the first thing to be done was to combine these different maps into one consistent GIS. Not only should the geometry cover the whole area, also the description and legend

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10 Cohen 2012
should be uniformed, without losing the link with the original datasets. Since (especially the older) maps where purely based on coring information, the geometry of the GIS could, and should be improved with modern LIDAR data. In the Netherlands we are very fortunate to have a high resolution, fully covered LIDAR data set, the AHN (Actual Elevation model of the Netherlands). With its 5 meter spatial resolution it is a great tool to refine the fossil river channels in a GIS.\textsuperscript{11}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{dutch_landscape_reconstruction.png}
\caption{The new palaeogeographic reconstruction of the Dutch landscape around AD800 by Vos (2011).}
\end{figure}

\textsuperscript{11} Berendsen & Volleberg 2007
The next step was to create a common map legend that gave the opportunity to show the several landscape elements that are important for settlements in one map. We have chosen for a simple legend depicting the several main landscape elements (channel belt, levees, crevasses and floodplains), with only a division in low, medium or high. This gave the possibility to combine all more complicated base maps, keep a good reference to their original coring data and yet make a clear map of the landscape in several periods.

Since the main objective was to reconstruct the landscape of Dorestad, the focus for this palaeogeographic map was to be around AD800, but in order to understand the landscape we also looked at the development of the active river channel leading up to AD800, from Roman times onward. This research could be carried out in the Dorestad – Vicus Famosus project. This project, funded by the Dutch Organisation of Scientific Research (NWO), aims at the completion of the research based on the old excavations of Dorestad.

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12 Steur 2011


for more on the contents of the project: http://www.erfgoednederland.nl/odyssee/projecten/25.-dorestad-vicus-famosus/item10657
The new old landscape of Dorestad

In the excavations of the harbour of Dorestad one thing became clear; the harbour works were extended in the river over time. The jetties were regularly repaired and elongated. This indicates that the river slowly moved away from the earliest jetty construction so that they had to be elongated to reach the migrating river. In previous reconstructions the aspect of the elongated jetties Dorestad harbour was taken along, but the whole length of the riverbank was considered as one, giant joined waterfront with numerous long jetties.
reaching out into the river at the same time. The modern development models for the then active river channel suggest however that the earliest harbour of Dorestad should have been in the northern region and expanded and slowly moved south. The active channel in the north moved eastward faster than it did in the central and south area of the city of Dorestad. For the northern part of the harbour extending jetties into the eastwardly migrating river was soon no longer an option. The central and southern area could continue for much longer. The harbour works not only shifted eastward, following the river, but over time southward as well in order to have good access to the water.

Fig. 10 – The migration of the harbour works with the changing river (generalized). Situation around AD700 (left) compared with that of around AD800 (right).

The new active channel reconstruction also gave an insight in the development of the area. from the iron age onward. Dorestad and its immediate surroundings are situated on a high channel belt that would have been quite safe during the yearly spring floods of the Rhine. In the late Iron Age the active channel would have been situated west of the later medieval city depositing a sandy levee that the Romans later used as a dry passage along the river Rhine onto which they built their main road. This road served as the main infrastructure along the Limes, the northern border of the Roman Empire. The new found presence of this channel gives rise to a new understanding of the Roman settlement on Wijk bij Duurstede De Geer, northwest of the main medieval town. One of the structures found in this area might have been Roman harbour works adjacent to the active channel of the Old Rhine, which was the main drainage channel of the Rhine in Roman times. In the post-Roman period the Rhine changed its course dramatically eastward by switching around a high point south of the city of Wijk bij Duurstede, at the location of the castle from the
1270s. This sudden switch made the river flow much further east, creating the site for the Dorestad emporium.\textsuperscript{14}

The broader landscape reconstruction not only gives an insight in the local situation, but also in an important reason for the settlement in a European view. Although the Old Rhine still was a main channel for the Rhine system, the branching off of the Lek River made it possible to reach the Zeeland coast from this location. A little west of Wijk bij Duurstede a small river formed a connection between the Lek and Waal rivers. This small river, the Zoel, was navigable in Dorestad times. The Waal and Meuse rivers were connected as well, a bit further to the south. The location of Dorestad, therefore, was right in the centre of several main waterways connecting the central European hinterland with the Scandinavian and English trade routes. The Rhine of course gave access to Germany, and via the Danube even to the Black Sea, the Zoel-Waal-Meuse route connected Dorestad with France, and the Old Rhine and Lek routes gave a secure passage to sea. With this landscape setting it is not hard to understand why Dorestad could become such an important emporium, and why Charlemagne granted tollage to this international trade centre.

**Dorestads demise**

The migration of the Old Rhine continued in the 9\textsuperscript{th} century. This had dramatic effects for Dorestad: the active channel, its raison d’être moved further and further away from its harbour site. The enormously elongated jetties no longer were practical. Another, more problematic, issue was the silting up of the Rhine mouth at Katwijk. This process already began in Roman times, but since the coast of Holland was a dangerous, closed coast, it was not an important sea-entry point. Ships sailed predominantly via the Vecht River to the Zuiderzee. But the continuation of the silting up at Katwijk meant that by the 9\textsuperscript{th} century the main drainage of the Rhine system had shifted to the Waal and the newly formed IJssel. Simultaneous the Zoel, the connection between Lek and Waal rivers, silted up as well. Dorestad was rapidly losing its important connecting rivers. The main trade routes shifted with the changing rivers. That meant the tollage at Dorestad could be by-passed and the old emporium lost its importance. Since the main drainage from the Rhine system now went via the Waal, Tiel, a small trade settlement south of Dorestad, where the former Zoel branched from the Waal, could grow to a new important trade centre. Likewise Dordrecht, in the west at the Waal estuary, took over the sea trade from Dorestad. And with the IJssel River becoming fully navigable cities like Deventer and Kampen took over the IJsselmeer (Baltic) trade.

The Dutch Rhine and Lek rivers became embanked to protect the land from more flooding. In this process the Old Rhine at the site of Dorestad was dammed in 1122, thereby completely losing its function as a navigable stream. In the 1270s a castle was built on the high ground near the Old Rhine dam around which the town of Wijk bij Duurstede grew.

\textsuperscript{14} Steur 2011
Fig. 11 – The development of the Old Rhine River. Map A depicts the Roman period (2nd century), B the late Roman period (3rd-4th century), Map C depicts the post-Roman transition (5th century), D the rise of Dorestad (6th-7th century) and E the end of Dorestad (8th century).
Fig. 12 – The several trade routes coming into Dorestad via their respective rivers.
Fig. 13 – The new trade routes via the Waal and IJssel Rivers meant Dorestad was no longer at the centre of the trade network. New cities, like Tiel, Dordrecht, Deventer and Kampen took over its role.

References

Anonymous, Geographia Ravennatis libri quinque.


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