

Explaining deficiencies of water management in the late medieval Flemish coastal plain, 13th–16th centuries

By the end of the 13th century a well functioning water control system had been initiated in the Flemish coastal plain. Dams had been built on all major tidal channels, large defensive dikes protected the land and still new land was gained by creating polders along the estuaries of both the Zwin near Bruges and the IJzer near Nieuwpoort. However, during the three centuries that followed, the history of Flemish coastal water control seems to have been a story of defeat rather than success, with a succession of heavy storm surges inundating thousands of hectares. Focusing on the organisation of water management, I will argue that the transformation of the rural economy in the late medieval coastal plain and the income strategies of both peasants and landlords profoundly affected the fragile equilibrium between human occupation and natural environment in this area. In my opinion the large-scale peasant dispossession and the increasing predominance of larger, more commercially oriented farms held in short-term lease, might have been at least partly responsible for the never-ceasing series of inundations and land losses between the late 13th and the end of the 16th century.

Tim Soens
Department of Medieval History
University of Ghent

Introduction¹

Since the 13th century the building and maintenance of dikes, waterways and discharge sluices in the Flemish coastal plain were the responsibility of local organisations, called ‘wateringen’ or water boards.² Apparently, in the late Middle Ages these water boards did not succeed in guaranteeing an appropriate level of security and protection against flooding: in Zeeland Flanders alone, a total of 45 parishes are reported to have been lost in the period between the end of the 13th century and the end of the 16th century (Goldschmitz-Wielinga a.o. 2004: 48-49; Van Dierendonck 2005). Furthermore, between 1280 and 1570 at least sixteen severe storm surges caused large-scale inundations along the coast of the southern Low Countries – on average one major storm surge every eighteen years, whereas in the 17th century, only one storm surge – 1682 – is regarded as ‘catastrophic’ by Gottschalk (1971-77: annexe 14).

As a consequence, it seems imperative to explain the obvious failure of the water boards.

However, unlike earlier viewpoints, one cannot always blame nature. Many so-called 'natural' disasters in historical times were actually human-induced, and this applies particularly to flooding in coastal regions (Steinberg 2001). Of course, geophysical events such as heavy rainfall or storms often proved to be the immediate causes of a disaster. However, the scale and impact of the inundations that ensued were to a large extent determined by the prevailing social, economic and political circumstances (Endfield, Fernandez Tejedó & O'Hara 2004). For the North Sea area, both sea level changes and changing intensity of storm surges have been overruled as main causes for land losses and inundations in the medieval and early modern periods (Augustyn 1992; Erynck a.o. 2000). Furthermore, an inadequate level of technology is also unlikely: recent research shows that often appropriate technology existed, but its application and diffusion was hampered by social-economical and institutional constraints (Kaijser 2002; van Dam 2002). Hence attention is increasingly drawn to the water management itself and especially to the functioning of the water boards. Unlike their Dutch counterparts, historiography paid only little attention to the Flemish water boards. Despite a tradition of more than 700 years linking the late Middle Ages to the 21st century, not a single scientific monograph was ever devoted to the history of an individual water board. Only in historical-geographical (Verhulst 1959b; 1995; Gottschalk 1955-58; 1984) and juridical or institutional (e.g. Fockema Andreae 1950; 1960; Gallé 1963; Meyer 2001) studies of the coastal area, the Flemish water boards received some attention. Yet, they were never credited with an important role in history.

In this article I will argue that a better understanding of the organisation and functioning of the water management in the late medieval Flemish coastal plain can help to explain the dynamics of both landscape and society in this area. In order to do so, I will analyse the water management in the context of the rural society. The integration of water management history and economic history is a recent but important turn in historiography (Thoen & Soens 2001; Van Dam 2004). After all, both the infrastructure and the institutions regarding water control were primarily conceived to meet the needs of agriculture and the rural population. In my view, the ways in which water boards were organised, their policies and investments, were profoundly influenced by factors such as the division of land and power in the area, the income strategies of both landlords and peasants, the productivity of agriculture and the size of holdings – in short by the 'social agro-system' (Thoen 2004) of the area.

Based on specific case-studies for the old castellany of Bruges – the most important part of the Flemish coastal plain - I will try to explain how the characteristics of the water control system were essentially linked to evolutions in the ‘social agro-system’. As a matter of fact, the water management in the late medieval Flemish coastal plain was increasingly adapted to the interests of large landowners, wealthy villagers and state officials, at the detriment of small peasant landowners. This accorded perfectly with the general transformation of the coastal plain from a society with a majority of small peasant landowners towards a commercial economy dominated by large farms and short-term leasehold, but was far from beneficial for the sustainability of both landscape and society.

The organisation of coastal water management in late medieval Flanders

Intensive human occupation of the coastal plain is not possible without a proper water management. Already in the 10th and 11th centuries, dikes, waterways and discharge sluices were constructed in the Flemish coastal plain (Verhulst 1959a; Tys 2005). This however does not mean that at that time specific organisations had been created to ensure the maintenance of the water control system. Some authors attributed the creation of water boards in the 12th (Verhulst 1995: 41, 48) or even 11th century (e.g. Coornaert 1976: 20-21; Huys & Vandermaesen 2000: 11). However, at that moment maintenance tasks were still performed by individual landowners, with local aldermen monitoring the maintenance work and sanctioning deficiencies. Only from 1230 on, traces of an organisation separate from the general administration are visible in the sources, both near Bergues-Saint-Winnoc (France) in 1236: ‘homines de Quatuor Dicis Bergensis officii’ (Van de Putte 1864: 367) and near Oostburg (the Netherlands) in 1239: ‘omnes in officio de Ostborgh, ad veterem Hevine pertinentes’ (Meyer 2001: 65ff.). At that moment these organisations still lacked a proper name and an executive board. From the 1270s on however, they would be called ‘wateringen’ (water boards) and were directed by ‘sluismeesters’ – literally ‘masters of the sluices’ (Gysseling 1977-1998: no. 346).

From that period on, all through the Flemish coastal plain, an increasing part of the water control system was no longer maintained by individual landowners, but kept up on a central level by water boards, varying in size from a part of a single village to ten villages or more. These water boards financed their activities by levying a uniform land tax - the so-called ‘geschot’ - and performed the maintenance works by hiring day-labourers or by entrusting

them to individual contractors. By the end of the 13th century, the rural water management in the area surrounding the city of Bruges had reached a level of monetarisation, centralisation and bureaucratisation – with series of annual accounts reaching back to the 1280s - unequalled by other regions in the North Sea area. Even in Holland, where much larger regional water boards, the so-called ‘Hoogheemraadschappen’, came into existence before 1200 (Van der Linden 1988: 539; Van de Ven 2003: 79), the actual maintenance continued to be done by the local village communities, even for regional hydraulic works. In turn, these village communities allotted the maintenance to individual farms, or later on, hired entrepreneurs. Until the 15th or even 16th century, the members of the regional water boards in Holland had merely a juridical and not an executive task: they were judges and inspectors, rather than administrators (e.g. Van der Ham a.o. 2004: 61-2; Van Tielhof & Van Dam 2006; for Zuid-Beveland in Zeeland: Dekker 1971: 571).

The early centralisation of works by water boards in the Flemish coastal plain is by no means a coincidence. It can perfectly be explained by taking into account two interrelated changes in the social property relations in that same 13th century: the increasing importance of absentee - in most cases bourgeois – landownership and the introduction of short-term leasehold. As long as the largest part of the land was directly cultivated by the owners of the land, a maintenance system based on allotment and personal liability was perfectly reasonable. But in 13th century Flanders in general and the coastal plain in particular more and more land was concentrated in the hand of landowners living in the booming cities of the county (Blockmans 1938: 404-18). Although urban landowners as well often used part of their landed property for direct food supply, most of it was not cultivated directly but leased out for cash rent, and the same was true for an increasing part of the estates belonging to religious institutions or noble families. Even among peasants, short-term lease gained importance. Compared to the sandy inland part of Flanders and many other regions in north-western Europe, the introduction and spread of short-term leasehold was particularly successful in the Flemish coastal plain (Thoen & Soens forthcoming; Van Bavel 2001). The cost of the water control system however, was still charged to the landowner and not to the farmer. With the ownership and the cultivation of the land being more and more dissociated, the levying of a land tax to finance the maintenance works was preferable to personal maintenance duties. This perfectly suited large landowners with much cash, but was rather pernicious for small peasant-landowners, with much surplus labour but little cash money.

In any case, from the 13th century on, the ‘wateringen’ were at the very centre of Flemish coastal water management. By the middle of the 16th century, some 128 water boards operated in the central castellany of the coastal plain

– the ‘Brugse Vrije’ – alone, varying in size from maybe five or ten hectares to more than 17,000 hectares (see figure 1 and Soens 2006: annexe 4). Their organisation consisted of three main branches: the general assembly of landowners, called ‘keure’ or ‘meentucht’; the executive board with two to five members (‘sluismeesters’) assisted by a clerk-treasurer, and finally a judiciary component (the ‘dijkschepenen’) who judged internal disputes, issued the levying of the land tax and inspected the infrastructure. Theoretically, the general assembly of landowners decided on all main issues concerning the water control system. This ‘participative’ model of decision-making has long been judged the core element of the water management system in the Low Countries (e.g. Van de Ven 2003: 30; TeBrake 2000: 126-7), thus falsifying the famous Wittfogel-thesis that links complex water management to centralised bureaucratic and autocratic states (Wittfogel 1955). Even if the clear leadership of elite groups in the executive boards forced us to doubt the ‘democratic’ characteristics of the late medieval water management (Soens 2001), it is clear that the gathering of the general assembly of a water board originally was an important moment in the everyday life in a polder area, a mobilisation of the local community not without resemblance to the numerous ‘communal’ manifestations in late medieval and early modern towns and villages (Blickle 2000). As we will see however, by the middle of the 16th century the importance of the general assembly had evaporated, forced by evolutions in the property and power structures of the area.

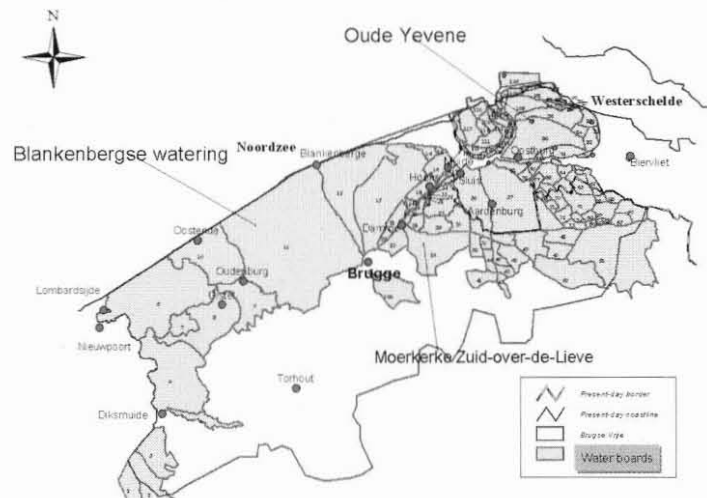


Figure 1. Water boards ('wateringen') in the castellany of the Brugse Vrije, around 1560. Source: Soens 2006: annexe 7.

The economic and environmental transformation of the coastal plain

During the late Middle Ages, rural society in the Flemish coastal plain witnessed important changes. At the end of the 13th century, peasant smallholders were still dominant, or at least very common, in coastal Flanders although they coexisted with a certain number of large holdings, including some giant ones. To survive, many of these smallholders needed an additional income via various activities such as wool processing, fishing and especially peat digging and salt making, activities which were practised on a very large scale in this area (Augustyn 1987; Soens 2002; Tys 2003b). As we will see, even the maintenance of the water control system could be a source of additional income to these inhabitants. Typically, these peasant smallholders enjoyed secure property rights over their land and holdings, often paying only a low customary rent, or even no rent at all.

This situation was about to change from the late 13th century on. Due to worsened environmental and socio-economic conditions specific for this area peasant smallholders faced a reduction of their income and an increase of their costs (Thoen & Soens 2001; Thoen & Soens forthcoming). On the one hand, soil conditions deteriorated, mainly due to peat exploitation and the degradation of the once mighty natural dune barrier that had protected the Flemish North Sea coast. The exploitation and drainage of the peat reserves near Furnes, Ghistel and especially along the Western Scheldt had provoked a significant fall in surface level similar to the evolution in other peat areas in the Netherlands (Borger 1992). By the end of the 14th century, most peat areas in the Flemish coastal plain were depleted, thus putting an end to an important proto-industrial activity, which had generated seasonal employment and additional income for many small peasants (Augustyn 1987).

What remained was a vulnerable, low-lying area, mostly consisting of poor sandy soils and easily inundated. Already in the last quarter of the 14th century, the most important peat area in the castellany of Bruges near Aardenburg was largely abandoned by men and turned into a part of the Western Scheldt estuary (Gottschalk 1953). In the same period, the Flemish coastal dunes progressively deteriorated and frequent sand drifts occurred, mainly due to human over-exploitation. In the 12th and 13th centuries ports such as Newport, Dunkerque, Ostend and Blankenberge had been set up in the dunes. Furthermore, the originally dense vegetation was perfectly suitable for pasture and exploited as such by the counts of Flanders (Augustyn 1992: I 260-318 and 1995). With the introduction of the rabbit at the end of the 13th century, a new threat to the landscape was created, especially when the animal escaped from the warrens and spread in the dunes, dikes and polders (Van Dam 2001b: 164-5).

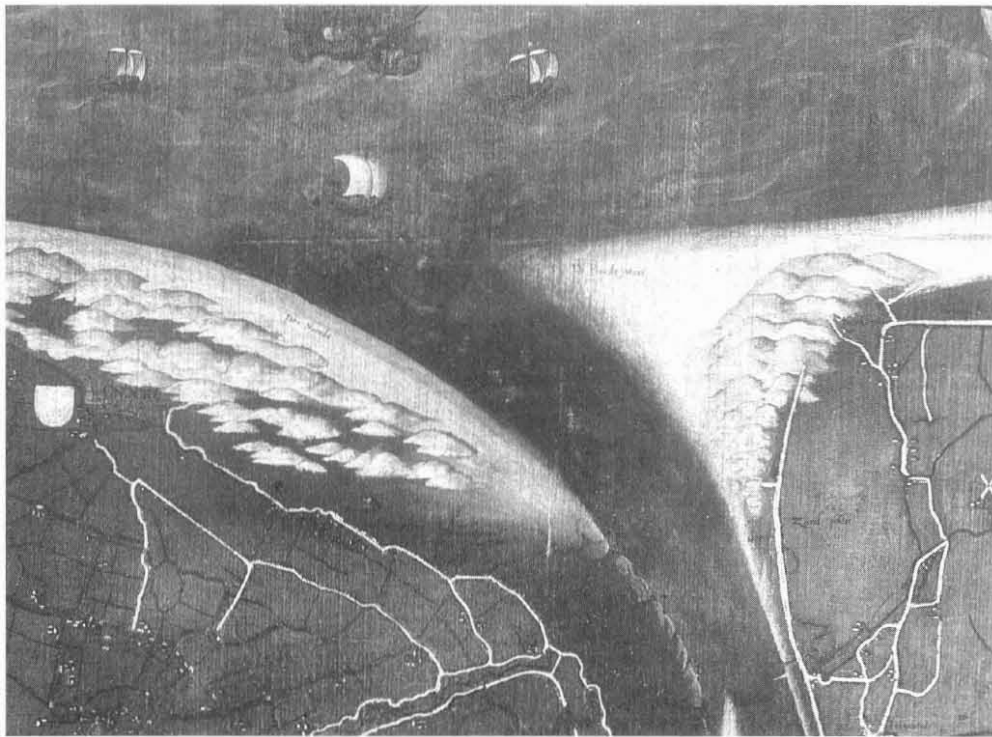


Figure 2. Dunes near the Zwin estuary on the so-called 'Heraldic map of the Brugse Vrije' by Pieter Pourbus (1561-1571, copy by Pieter Claeissens 1596-1601). Source and copy-rights: City Archives Bruges.

As a consequence, the vulnerability of the coastal plain to inundations was increasing, and with it the cost and risks of living and farming in the area. Paradoxically, the free status of peasants and land in the coastal plain, due to the absence of traditional seigniorial structures and the unchallenged authority of the count of Flanders, would make the peasants extremely vulnerable, as it favoured the transfer of land to non-peasant landowners, the early introduction of short term leasehold, and a swift expropriation in case of insolvency (Thoen 2004: 56). Many smallholders were eventually forced to give up their land and this resulted in an impressive concentration movement of landed property. Until recently, it was very difficult to measure the impact of this evolution. Thanks to the land surveys – the so-called 'ommelopers' – and other sources provided by the tax administration of the water boards, I was able to reconstruct a significant sample of property structures in the coastal area (see table 1). Whenever it was possible to analyse these property relations for one area and two different periods, the number of landowners had decreased between the two sample dates:

Water Board	Area (hectares)	Year 1	Landowners / 100 ha	Year 2	Landowners / 100 ha
<i>Oude Yevene (Oostburg)</i>	3529.7	1388	41.4	1550	14.3
<i>Romboutswerve (near Damme)</i>	420.7	1456	35.9	1545	18.4
<i>Moerkerke Zuid-over-de-Lieve</i>	1731.3	1470	15.7	1530	10.7
<i>Blankenbergse (polder area)</i>	14746.2	1513	8.1	1560	7.1
<i>Blankenbergse (inland area)</i>	2267.6	1513	16.7	1560	15.5

Table 1. Landownership in the late medieval coastal plain. Source: Soens 2001 (*Oude Yevene*); Bruges, OCMW-archives, Saint John, 5 A 15 and State Archives, *Romboutswerve*, 99 (*Romboutswerve*); Bruges, State Archives, *Blankenbergse*, 183-184 (*Blankenbergse*); Bruges, Groot-Seminarie, *Spermalie*, 46 and State Archives, *Brugse Vrije*, 16036 (*Moerkerke Zuid-over-de-Lieve*).

It is clear that between the 14th and the middle of the 16th century, a radical restructuring of the property relations in the coastal plain took place. In the *Oude Yevene* in present-day Zeeland Flanders, the number of landowners decreased from more than 41 per hundred hectares in 1388 to only 14.3 in 1550. By the middle of the 16th century, 28 landowners owned 45% of the area, with an average of 49.9 hectares each. Whereas in 1388 the land area of 1289 individuals did not exceed five hectares, in 1550 this remained true for only 303 individuals, which means that between the end of the 14th and the middle of the 16th century, 1000 small landowners had 'disappeared', or at least lost the property rights over their land. It is not impossible that part of the peasant-smallholders continued to work the lands their ancestors had owned, but now in the capacity of leaseholder, paying a full, competitive market rent to the new owners, who in large majority leased out their newly acquired lands. For the neighbouring castellany of Furnes, Vandewalle (1986: 95) calculated that more than 90% of all land in the polder area was held in short-term lease by the middle of the 16th century. In contrast to the declining number of customary and free holdings, the farms held in short-term lease were increasing both in number and in size. In *Watervliet* for instance - a 16th century re-embankment in the Western Scheldt area - only 18.8 % of the land in 1544 was worked by the landowners themselves, the rest had been leased out. No more than 37 of the 138 farms were still fully owned by the inhabitants who worked them. With one exception, all of these were farms smaller than five hectares. In contrast, 58% of the area was cultivated by 25 farms larger than twenty hectares, all of them at least partly held in short-term lease.³ Although this was not yet the 'grande agriculture' practiced in the area during the 17th and 18th centuries, when one third of all farms exceeded 50 hectares (Van Cruyningen 2000: 98-103), it is clear that the once flourishing peasant economy in the area had already vanished by the middle of the 16th century.

As peasant landowners lost their land, others could of course extend their landed property. Both institutional and bourgeois landownership were gaining importance. For instance, in the ‘watering’ of Moerkerke-Zuid-over-de-Lieve, ten kilometres east of Bruges (see figure 1), religious institutions owned 31.5 % of the land in 1530 and urban citizens, most of them living in Bruges, another 45% (see table 2).

	Owners	%	Hectares	%
Religious institutions	43	23.1	545.6	31.5
Townsmen	58	31.2	779.2	45.0
Inhabitants of Moerkerke	34	18.3	303.2	17.5
Inhabitants of Sijsele	33	17.7	49.3	2.8
Inhabitants of Vijve	7	3.8	21.2	1.2
Other	11	5.9	32.8	1.9
Total	186	100.0	1731.3	100.0

Table 2. Landownership in the ‘watering’ Moerkerke Zuid-over-de-Lieve 1530⁴. Source: Bruges State Archives, Brugse Vrije, no. 16036.

As a result, most of the land in the 16th century coastal plain was owned by individuals who did not live in the area themselves - an evolution that had important consequences for the water management as well. Not all the landowners however were clerics, townsmen or state officials: a small minority of the peasant population profited by this evolution and was able to accumulate a substantial amount of land – often up to 20, 30 or even 70 hectares (see table 3).

Landowner	Hectares
Abbey of Zoetendale	140.0
Abbey of Spermalie*	139.4
Abbey of Sarepta*	79.1
Nicolas Waesschale (heirs)*	72.3
Lord Abbaert*	69.8
Cornelis f. Jan van Wulpen*	66.7
Jan van Nieuwenhove*	62.0
Jan van Damme (heirs)*	46.2
Anthuenis Slock (heirs)*	45.3
Willem Roelins*	44.3

Table 3. The ten most important landowners in Moerkerke Zuid-over-de-Lieve 1530 (*townsmen). Source: Bruges State Archives, Brugse Vrije, no. 16036.

In the same test-case for Moerkerke Zuid-over-de-Lieve in 1530, among the ten most important landowners, we find three abbeys and five townsmen, probably all of them citizens of Bruges, but also two inhabitants of the parish of Moerkerke, *Willem Roelins* and *Cornelis f. Jan van Wulpen*. Willem Roelins was owner of two farmsteads in the 'watering'. He leased out one of them, and lived in the other, called 'Ramsburch' - a name indicating a certain level of prestige. Cornelis van Wulpen was a member of a local family that had systematically been extending its landed property in the area: in 1470 family members already owned 47.6 hectares of land in the 'watering' and sixty years later this number had increased to 82.3 hectares.⁵ Based on probate inventories, fief registers, tax payments and other sources, it was possible to reconstruct the social relations and prosperity of men such as Roelins and Van Wulpen. When Cornelis van Wulpen and his wife died shortly after 1530, they left to their six underage children 103.9 hectares of land; 27 fiefs (including another 20.7 hectares of land and parts of the tithes of flax, meat and beer in the parish of Moerkerke), movable goods worth the considerable amount of 68 lb. 11 s. 4 d. Pound Flemish (411.4 guilders) and two houses in the city of Aardenburg.⁶ These inhabitants belonged to a new kind of village elite that had ensued due to the ongoing social polarisation in the late medieval coastal plain. They were bound to each other by family ties, economic transactions and office-holding. Living in the same parish from generation to generation, some of them had made money by leasing tithes or large farms from urban or ecclesiastical landowners, others practised a technical profession, for instance as land surveyor ('landmeter') or acted as steward for a large absentee landowner (Soens 2006: 382-409). Little is known about this rural 'polder' elite in the 15th and 16th centuries, but their ascension resembles the rise of the 'yeomen' in 15th and 16th century England (Whittle 2000: 167-77; Allen 1992: 66-77), while prefiguring in a certain sense the 'fermocratie' dominating the Artois and Île-de-France regions of 'grande agriculture' between the 17th and the 19th centuries (Jessenne 1983; Moriceau 1994). Important for us is their strong attachment to local office-holding. As the water control system was a key element in the rural society of the coastal plain, the village elite crowded the boards of the local 'wateringen'.

Four characteristics of water management policy in a restructured rural society

The drastic transformation of property relations in the late medieval coastal plain directly influenced the organisation of water management. This is hardly surprising: the water board represented the landowners, the general assembly of landowners decided on major issues (at least theoretically) and its activities

were financed by a land tax, paid by the landowners in proportion to their landed property in the area. Hence, changes in the landownership and the property relations in the area were reflected in the organisation and also in the policies of the water boards. I will try to demonstrate that the increase of large and often absentee landownership next to the rise of a new village elite and the ruin of the peasant smallholders had important consequences for the quality of the water management in the area and probably contributed to the numerous inundations in this period.

Landlords' interest in low investments

The more property was concentrated in the hands of large landowners, the more the latter could extend their influence on the water management policy. After all, the 28 landowners who owned 45% of the land in the large 'Oude Yevene-watering' in the middle of the 16th century (*supra*), also furnished almost half of the yearly budget. Undeniably these large landowners were the main 'sponsors' of the water boards and as such they always kept a close watch on the latter's expenses. In the course of the 15th and even more in the 16th century, there is increasing evidence of investments in water management being judged too high by important ecclesiastical and other landowners. In 1566 for instance they forbade the administrators of the 'Gaternisse-watering' in the western part of present-day Zeeland Flanders to proceed to emergency dike repairs without prior approval of the main landowners (the 'grote gelanden'), inhabitants of Bruges as well as others. The winter of 1564-65 had been very severe (Gottschalk 1975: 610-1; Buisman 1998: III 598-9) and the dikes of Gaternisse were damaged by ice and a heavy storm in January 1565. In the aftermath of these events, the executive board hastily proceeded to major repair works and also raised the height of a certain number of dikes. When the account of these works was presented to the landowners, the largest of them were not amused and considered the expenses superfluous and the price paid exorbitant. Although the gathering of the large absentee landowners was time-consuming and prevented a quick response in emergency situations, the new rules necessitated the prior approval of the large landowners before starting any kind of works.⁷

In 16th century Holland the water management saw a similar evolution towards a strict and increasingly institutionalised budgetary control by the main landowners, leading to the creation of 'colleges van hoofdingelanden' (Fockema Andreae 1952: 8-13; Van de Ven 2004: 114-8) and on some of the Zeeland isles, similar institutions existed already from the 15th century on (De Klerk 1996; Dekker 1971: 570-7). In the Flemish coastal plain, this increased control by large landowners replaced a more active participation of

the total community of landowners. This can be proved by calculating the number of general assemblies: in the 14th century, the assembly of the largest 'watering' in the castellany of Bruges, the 'Blankenbergse watering' (see figure 1) was often convoked four to seven times a year, to inspect infrastructure, to decide on major investments, to audit the annual account or to resolve a dispute. In the 16th century, on the contrary, it became highly unusual for the general assembly to be convoked more than once a year. Instead there was an increasing number of meetings of the executive boards with 'some' or the 'principal' landowners (Soens 2006: 91).

As we have seen, these principal landowners leased out most of their land. Hence, their net income depended on the evolution of the lease prices per hectare minus the reinvestments they had to afford. Comparative studies show that landlords were rarely prepared to reinvest more than twenty percent of their profits (Van Bavel 2001: 30). In the Flemish coastal plain, the cost of water management could vary significantly between individual 'wateringen', depending on location, soil conditions, exposure to the sea, quality of the infrastructure, etcetera. Regional divergences in lease prices, however, were more limited. In figure 3, I compared the investments in water management related to the lease revenues in two different water boards: the quiet 'Blankenbergse watering' along the North Sea coast west of Bruges and the stormy 'Oude Yevene' in western Zeeland Flanders (see figure 1). Perhaps the most interesting series is the one for the 'Blankenbergse watering', which is typical for an important part of the coastal plain: investments in water management never exceeded ten percent of the rent income per hectare. Since leases in the first half of the 16th century were in general not adapted to the high inflation in that period (Thoen 1988: I 537), the (real) investments in water management actually show a downward movement.

In more problematic areas, however, reinvestments could be significantly higher. In the Oude Yevene, for instance, in normal years 20 to 30 percent of the rent had to be reinvested, rising to 40 percent and even higher in difficult periods, such as the end of the 14th century and the third quarter of the 16th century (see figure 3).

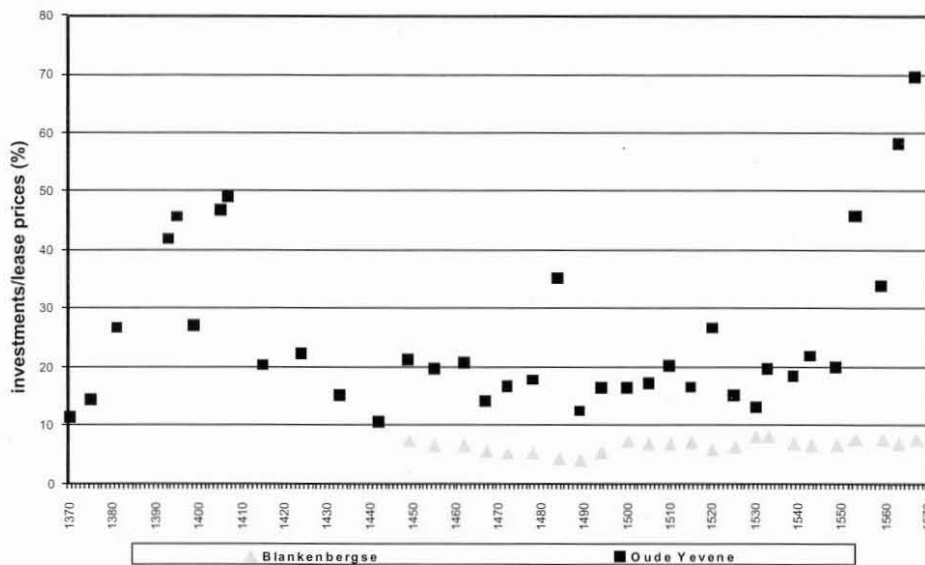


Figure 3. Reinvestment of lease income per hectare into water management (5 years' average; %). Source: based on income and expenses of the Bruges hospital of Saint-John, the Ghent abbey of Saint Peter and the leper house Saint Magdalene of Bruges (Soens 2006: 312).

When differences between regions became too significant, it was increasingly tempting for large landowners to give up their least profitable properties. In the course of the 15th and 16th centuries, there are numerous examples of abbeys and hospitals 'abandoning' possessions in the most endangered areas: by 1553 most religious institutions had retreated from the threatened 'Oude Land-watering' on the isle of Kadzand, with exception of the local church and the Ghent abbey of St. Bavon.⁸ In 1487 the latter abbey tried to abandon its landed property on the isolated isle of Biervliet, where rats had been undermining the dikes.⁹ In 1523 they did the same with their possessions in the Scheldt polder village Weert, thus ending their activities in an area David Nicholas (1976: 264) called an 'infertile, easily inundated polder area with limited economic potential'. In the same respect, the efforts of the Cistercian abbey Our Lady of the Dunes to get rid of the high cost of dike maintenance on (some of) its estates in the eastern part of Zeeland Flanders are well known (de Kraker 1997).¹⁰

As a consequence of income strategies with a view to short-term maximisation of profits, the most vulnerable areas of the coastal plain faced a vicious spiral: as the cost of dike maintenance was already high compared to other regions, landowners tried to limit investments as much as possible, thus further increasing the risk of inundations and general collapse...

The exclusion of smallholders in the water control system

As the weight of large landowners in the water management was steadily increasing, the involvement of smallholders was fading away. In the previous paragraph, I already discussed the declining number of general assemblies, effectively reducing the participation of small landholders. But there are other examples that prove that the evolution of the water control system disadvantaged smallholders.

Before the creation of the water boards, the maintenance works were perfectly adapted to a rural society where smallholders were predominant: the allotment of maintenance works known as 'verhoefslaging' in the northern Netherlands, permitted smallholders to carry out maintenance and repair works themselves, often during months when activity in agriculture was limited (Van Dam 2001a: 222-4). From the 13th century on, the water boards took over these works and a land tax gradually replaced these maintenance duties. The payment of these taxes was strictly regulated: within two or three weeks the money had to be handed over to the treasurer of the water board. Particularly in times of war, inundation or crop failure, it must have been difficult for peasant landowners to find enough cash money, which left them with a competitive disadvantage compared to leaseholders (Thoen & Soens forthcoming).

To a certain extent, smallholders could compensate for the land tax by working for the water board. During the first centuries of their existence, the water boards continued to employ large numbers of (seasonal) day labourers. In the oldest surviving accounts of the 'Blankenbergse watering', impressive numbers of *operarii* (manual workers) supervised by foremen are mentioned.¹¹ Table 4 shows that during the 13th and 14th centuries the 'Blankenbergse watering' remained an important employer, with a record of 23,788 man-days of unskilled labour in 1354-55. In the late 15th and the 16th century employment of day labourers by the water board was significantly lower, even though by that period, the maintenance tasks also included the cleaning of waterways and the repair of roads, which was not yet the case in the earlier period.

Financial Year	Average wage (denarii groten/day)	Man-days (total)	Financial Year	Average wage (denarii groten/day)	Man-days (total)
1285-86	0.60	12,908	1478-79	6	1,808
1293-94	0.75	2,274	1488-89	6	1,192
1304-05	0.45	1,184	1498-99	6	1,609
1343-44	1.00	9,831	1520-21	6	1,433
1354-55	1.50	23,788	1528-29	6	1,557
1364-65	3.00	9,742	1538-39	6	1,675
1374-75	4.75	3,207	1548-49	7	2,505
1383-84	4.00	763	1559-60	8	617
1407-08	4.75	2,777	1568-69	12	891
Average		7,386	Average		1,476

Table 4. Unskilled day labourers employed by the 'Blankenbergse watering' (sample years, 1285-1569). Source: based on accounts of the 'Blankenbergse watering', for a detailed list, see: Soens 2006: 629-35.

In the 14th century, dike repairs still affected the whole rural society. In case of emergency, common law forced all inhabitants to watch the dikes and to assist in preventing or closing breaches. This was the so-called 'dijkweer', perhaps dating back to the Carolingian period (Blok 1984: 5), which still existed in the late medieval coastal plain. In the last quarter of the 14th century for example, repeated inundations took place all over the Flemish coast. In the 'Eiesluis', a water board west of Bruges, officers summoned the inhabitants to the dikes on several occasions. According to the accounts of the water board not only peasants obeyed this call, but the local lords and monasteries sent horses and servants as well.¹² From the second half of the 15th century on, this kind of massive mobilisation became rare. Instead, more and more works were 'outsourced' to professional entrepreneurs, often involving a public procedure. From that moment on, an increasing part of dike works were realised by individuals who did not live in that particular area. When in 1500 for instance a new dike was constructed on the isle of Kadzand, most of the contractors originated from the Zeeland Isles, Holland or the 'Vier Ambachten' (eastern Zeeland Flanders), and not from Kadzand itself (see figure 4).¹³

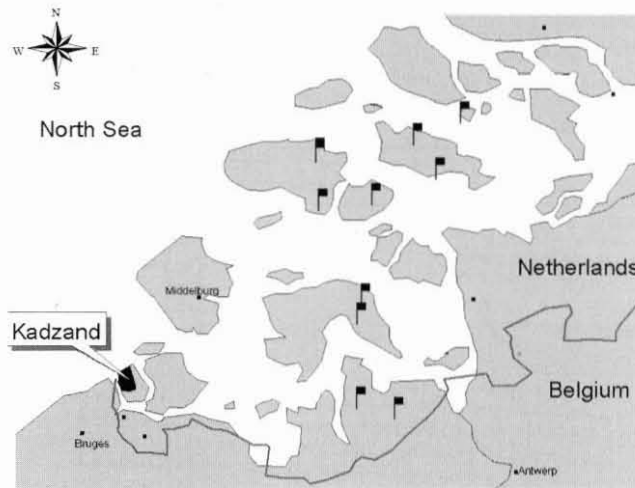


Figure 4. Contractors of a new dike in the polder Oude Land on the isle of Kadzand, 21 March 1500 (flags indicating contractors' place of residence). Source: Ghent State Archives, Sint-Baafs and Bisdom, no. 14381 K 9089.

As a result, instead of being an additional income, water management increasingly turned into a heavy financial burden for peasant smallholders. Although the large landowners had a clear interest in maintaining a low level of average investments, the irregularity of the taxes levied could be pernicious for small landowners. From 1383 to 1410 for instance, landowners in the 'Oude Yevene-watering' in Zeeland-Flanders had to spend the equivalent of more than 200 litres of wheat per hectare on investments in water management one year every three, with a peak of 343.7 litres in 1394-95 (Soens 2005: 86). In a period of civil war, incursions by English troops and repeated inundations, smallholders might have found it very difficult to commercialise a part of their harvest large enough to pay these taxes.

Water boards and the accumulation of (social) capital by village elites

A minority of the local population did not face these kind of problems. For the few local landowners who survived the concentration of landed property in the late Middle Ages, water management in the coastal plain evolved in a positive way. As we have seen, by the middle of the 16th century most land in the coastal plain was held by landowners or institutions that did not live in the area itself. In the 15th and 16th centuries, the absentee landowners were not keen on joining the executive board of the mostly small-scale 'wateringen'. They preferred to restrict themselves to budgetary control and the establishing

of water management policies. The day-to-day supervision of the water control system was left to local inhabitants, who could be elected member of the board ('sluismeester') by the general assembly. As landownership was a precondition to be elected, the number of candidates decreased along with the number of landowners. In 1530 for instance, in the water board of Moerkerke Zuid-over-de-Lieve – measuring about 1,731 hectares – there were only 34 landowners left who were actually living in the central parish of Moerkerke (see table 2). At least nineteen of them were one day elected member of the board or treasurer, while only three of the 58 urban landowners and only one other landowner were also active in the water board. This relative openness of the board for local landowners gave the impression of a participative organisation, but in reality the board was dominated by a limited number of wealthy villagers who were elected time and again and who passed their membership of the board from one generation to the next. As an example, I tracked the activities of the single most important local landowner in the area, the family *Van Wulpen* (table 3) in the board of Moerkerke Zuid-over-de-Lieve during the 15th and the first half of the 16th centuries (Soens 2006: 381-382, largely based on the accounts of the water board):

- *Jan (I) van Wulpen*: several times treasurer (at least nine terms), 'sluismeester' and alderman ('dijkschepen') from 1427 until 1468.¹⁴
- *Vrancke (I) van Wulpen*: possibly a son of Jan (I); 'sluismeester' from 1465 to 1467 and 'dijkschepen' in 1468.
- *Jan (II) van Wulpen*: treasurer during at least fourteen terms from 1483 to 1506. Also acting as 'sluismeester' and alderman in the same period.
- *Vrancke (II) van Wulpen*: possibly a son of Jan (II); at least eight terms in the board between 1489 and 1501, both as 'sluismeester' or alderman.
- *Pieter*: possibly a son of Jan (II): alderman and 'sluismeester' in the years 1502-1504.
- *Cornelis f. Jan*: possibly a son of Jan (II). Repeatedly elected alderman from 1510 to 1516, 'sluismeester' in 1515 and again from 1525 to 1528.

For individuals like the *Van Wulpen* family, access to the board of the local 'watering' confirmed their position on top of the village society. Although the official financial remuneration was often limited – from 1417 to 1547 the normal salary of a 'sluismeester' in Moerkerke Zuid-over-de-Lieve was fixed at eighteen 'pound parisis' (nine guilders) a year or the equivalent of 36 day wages of a skilled labourer¹⁵ – the indirect profits were high, both in terms of economic and social capital. Economically, the members of the board had to buy materials and negotiated with contractors, which undoubtedly created opportunities for favouritism and bribing. Even though this kind of 'gift exchange' was an essential part of medieval and early modern public service

(Wagenaar, Van der Meij & Van der Heyden 2005: 15-6), repeated anti-fraud regulation of both the general assemblies of 'wateringen' and the aldermen of the castellany tried to limit its dimensions (Gilliodts-Van Severen 1879: 494-8: decree of the aldermen of the 'Brugse Vrije', around 1504). Furthermore, the membership of the board of a 'watering', connected well-to-do villagers like the *Van Wulpen* family to other members of the village elite, and also to the large absentee landowners, whose landed property they could manage and whose tithes they could lease. By doing so, they expanded their networks, connections and social obligations, thus accumulating a more immaterial kind of capital, labelled 'social capital' by Pierre Bourdieu (1986).

With regard to the water management policy itself, the leading villagers who crowded the water boards had not yet acquired the autonomy vis-à-vis the large landowners that characterised the water management in Zeeland-Flanders during the 17th and 18th centuries (Van Cruyningen 2001: 63-5). In the 15th and 16th centuries all major investments had to be approved by the largest landowners, those living in the city as well as monasteries and noble families. I mentioned already the frequent meetings of the board of the 16th century 'Blankenbergse watering' with delegations of important landowners. Members of the board also continuously travelled to monasteries and other important landowners to obtain advice or to be instructed on important matters. In 1438-39 the board of Moerkerke-Zuid-over-de-Lieve even sent a messenger as far as Dordrecht to consult Lodewijk, lord of Moerkerke and Merwede, and councillor in the central court of Flanders, informing him about the deplorable state of the discharge sluice and asking his opinion on this matter.¹⁶

For the large absentee landowners and the village elite a win-win-situation was created: the former could control and restrict investments, while leaving day-to-day problems to wealthy villagers, who gained money and prestige and could extend their social networks.

The complexity of interests in water management

In the densely populated late medieval county of Flanders, the autonomy of the water boards in setting out water management policies was always limited. Changes in the water control system directly affected the interests of the many large and small cities of the county that considered the waterways in the area of vital importance for their commercial activities. Not surprisingly, conflicts with water boards were numerous and complex. In a case study concerning the Ieperleet, the waterway connecting Ypres to Bruges, in the first half of the 15th

century, Sortor (1998) demonstrated how urban investments in waterways were affected by changing trade networks, and how the outcome of a project was compromised by clashes of interests between cities, rural communities and the count of Flanders. In this particular case, the water boards of the castellany of Bruges were allied to the city of Ghent trying to prevent Ypres from increasing the water flow in the Ieperleet. In doing so, Ghent and the water boards both had a different motive: Ghent wanted to harm a commercial competitor whereas the water boards feared increased flooding.

In resolving the manifold disputes between water boards, cities and individual landowners, the count of Flanders and his central government had an important mediating role (Soens 2006: 445-54). Nevertheless, the central government of the count of Flanders - from Guy de Dampierre in the late 13th century to Philip II of Spain in the second half of the 16th century - failed to develop a coordinating policy with regard to water management. Throughout this period, their structural involvement in water management remained limited to two main prerogatives. First of all, the count owned the dune barrier protecting the Flemish coast and exploited the dunes like any other part of his domain, with often disastrous consequences for the sustainability of this fragile environment (Augustyn 1995). Secondly, his regal right on uncultivated lands - the so-called 'wildernisregaal' (Tys 2004), handed over to the count all grounds that had been 'abandoned' by their owners. In the coastal area, the 'right of abandon' permitted the overlord - in this case the count of Flanders - to expropriate any landowner unable or unwilling to finance dike maintenance or repair works. The 'right of abandon' was often enforced after storm surges, when major repair works or re-embankments imposed huge financial demands on the landowners. In most cases, however, the count did not intervene directly in re-embankments, but permitted to one or more important landowners - called 'leggers' in the late Middle Ages - to take the responsibility of the works, to levy the necessary taxes and to take over the property rights of all former owners who had failed to pay (Thoen & Soens 2001: 16; Soens 2001: 49-50; Gottschalk 1983: I: 175-177; Meyer 2001: 74-104). Once again, this kind of institutional arrangement created magnificent opportunities for state officials and other important landowners with access to the central government for a rapid expansion of their landed property in the coastal area - and once again this happened at the detriment of small landowners who were forced to abandon their lands.

To conclude: water management, economy and ecology

In this article I discussed the role of historical water management as a key element in understanding the complex interaction of environment and society in coastal areas. The specific institutions, organisations and policies developed with regard to water management enabled permanent occupation of an area where water was omnipresent, but could also cause long-lasting environmental problems. In turn, the water management itself always reflects the way local society is structured. In many cases failing or short-sighted water management due to socio-economic or political constraints offers a better explanation for environmental problems such as land losses, the degradation of coastal dunes, shifting rivers and estuaries than sheer physical processes. By focusing on these water management problems and constraints, history can thus help to counteract the 'naturalization of natural hazards' as Ted Steinberg (2001: 35) has put it.

In the late medieval Flemish coastal plain a radical restructuring of rural economy took place, completely annihilating the former predominance of small-scale peasant landownership. Water management was gradually adapted to this evolution, first by replacing personal maintenance duties by tax payment and the creation of water boards to perform maintenance and repair works, later by reinforcing the position of large absentee landowners and wealthy villagers. These two groups gained considerably by the concentration of landed property and the engrossment and further commercialisation of rural economy. In this article I discussed four main characteristics of the profoundly changed water management that resulted from this evolution, each of them with important consequences for the fragile coastal environment. First, investments in water management depended more and more on the income strategies of absentee landowners who leased out their lands. Especially in times of diminishing lease income per hectare, they had a strong interest in limiting reinvestments, with disastrous consequences for the most vulnerable areas of the coastal plain. Secondly, the cost of water management became a heavy financial burden for small peasant landowners, who were no longer able to avoid taxation by supplying labour instead of money. In general, the involvement of the rural population in water management became less important, thus undoing what has always been judged a main characteristic of water management in the Low Countries – the participation of large sections of the rural population. Furthermore, the daily supervision of the water control system was increasingly concentrated in the hands of a small group of wealthy villagers, who used their position in the local water boards to enhance their own status in the village society. And finally, the existing balance of power between the count and the important cities and between cities and their surrounding countryside, prevented a more regional or central

coordination of water management policies, and resulted in many sub-optimal arrangements for the upkeep of dikes, sluices and waterways.

Without doubt other elements are important too in explaining the deficiencies of late medieval coastal water management. Warfare and civil uprisings for instance disrupted normal maintenance procedures and increased the vulnerability of infrastructure. But in the long run, changes in the social distribution of property and power in relation with the income strategies of peasants and landlords proved to be primordial elements in explaining the evolution of water management and the apparent impossibility to counter the repeated flooding.

- 1 This article is a partial result of my PhD-research project supervised by Erik Thoen and submitted at the University of Ghent in January 2006. My ideas on the evolution of historical water management in the coastal plains of north-western Europe have been greatly influenced by numerous discussions with Erik Thoen, Bas van Bavel, Petra van Dam, Dries Tys and other scholars. I also wish to thank dr. Petra van der Jeught for correcting the English text.
- 1 In accordance with the terminology developed by institutional economists, we prefer using the term 'organisation' instead of 'institution' for a water board, institutions being 'the rules of the game' and organisations 'the players' (North 1993).
- 3 Ghent City Archives (GCA), series 28bis 2/32: so-called 'penningkohier' 1544. Watervliet was a recent seignior created at the beginning of the 16th century by an important state official: Jeronimus Lauwereyn, treasurer of duke Philip the Fair. We intend to analyse his engagement in the re-embankment of the Braakman-area in present-day Zeeland-Flanders in a separate publication. For the moment, we refer to the works of Gottschalk (1983²: 122-4) and De Kraker (1997: 34-7).
- 4 The document distinguishes between religious institutions, 'poorters' (burghers), inhabitants 'in Moerkerke', 'in Vyve', 'in Sysel' and others. Not the personal statute (e.g. in possession of burghership) but the place of residence seems to have been decisive. The category inhabitants 'in Moerkerke' probably included all inhabitants living in (the parish of) Moerkerke, irrespective of their personal subordination to the jurisdiction of the aldermen of the castellany, the magistrate of a seignior or a city.
- 5 Calculations based on the 'ommelopers' of 1470 and 1530. Bruges, Groot-Seminarie, Spermalie, 46 and State Archives (BSA), Brugse Vrije, 16036 (Moerkerke Zuid-over-de-Lieve).
- 6 BSA, Registers Vrije, no. 16570, f^o 137r, entry dated 1533/02/28 (n.s.).
- 7 BSA, Registers Vrije, no. 15170, f^o 17r – 1566/05/06.
- 8 Ghent State Archives (GSA), Sint-Baafs and Bisdom, no. K 1098: 'ommeloper' of the Oude Land-polder 1553, with indication of abandoned lands.
- 9 GSA, Sint-Baafs and Bisdom, no. 2614-2616.
- 10 Interestingly, despite all lamentations, the only available domanial account of the abbey for this area - for 1560 - still indicates a net profit of 54.8 % (De Kraker 1997: 272-274).
- 11 '*Operarii de feria sexta post medium aprillem usque translationem Beati Thome DC XXVI man dachwerc pro die VII s. d.: summa 19 lb. 11 s. 3 d. Item operarii de translatione Beati Thome usque festum Beati Mathei CCCCLIX man dachwerc pro die IX d. summa 17 lb. 4 s. 3 d.... Jobanni Fachelare de bedrivene dikers & operarios CXVII dies pro die XII d., summa 5 lb. 17 s.*' (Gysseling 1977-1997: nr. 1329 account 1293-1294).
- 12 Bruges, OCMW-archives, Saint-John 'wateringen' box 10: account 1376-77; account 1377-78; box 11: account 1397-98.
- 13 Contractors originated from Hengstdijk (eastern Zeeland Flanders), Zierikzee (Schouwen-Duiveland, Zeeland), Oude Tonge (Oostflakkee, South-Holland), Biezeling (Kapelle, Zeeland), Wemeldinge (Kapelle, Zeeland), Zomerdijk (possibly Sommelsdijk, Middelharnis, South-Holland), Grauw (eastern Zeeland-Flanders), Duiveland (Schouwen-Duiveland, Zeeland) and Korendijk (South-Holland). The identification of 'Roovers havene alias Nieuwer Sluus' with Brouwershaven is less certain. For three other contractors no place of residence is mentioned.
- 14 With an interruption between 1433 and 1448 which could indicate a further distinction between two generations with the same name.
- 15 A combination of two separate salaries: one for the board of Moerkerke Zuid-over-de-Lieve and one for the board of the 'joint' water board Moerkerke Zuid-over-de-Lieve, de Broeke and Stampershoeke.
- 16 Account of Moerkerke Zuid-over-de-Lieve, de Broeke and Stampershoeke 1438-39: BSA, Archive Moerkerke Zuid-over-de-Lieve no. 298/1.

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