The lifecycle of casks: the production, use, and repurposing of casks in the Netherlands (1300–1800)

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6.1 Introduction

This chapter examines the repurposing of casks in the Netherlands during the Late Middle Ages and Early Modern period, the last phase in the lifecycle of casks (Figure 6.1). Although casks were originally produced for the storage and transport of goods, they continued to serve a wide variety of purposes long after their primary function had ended. Their sturdy wooden construction made them suitable for a wide range of secondary uses. The following sections first discuss the different ways in which casks were repurposed, after which the research design of this case study is presented, focusing on their repurpose as cesspits and water wells in the Dutch town of Vlissingen.

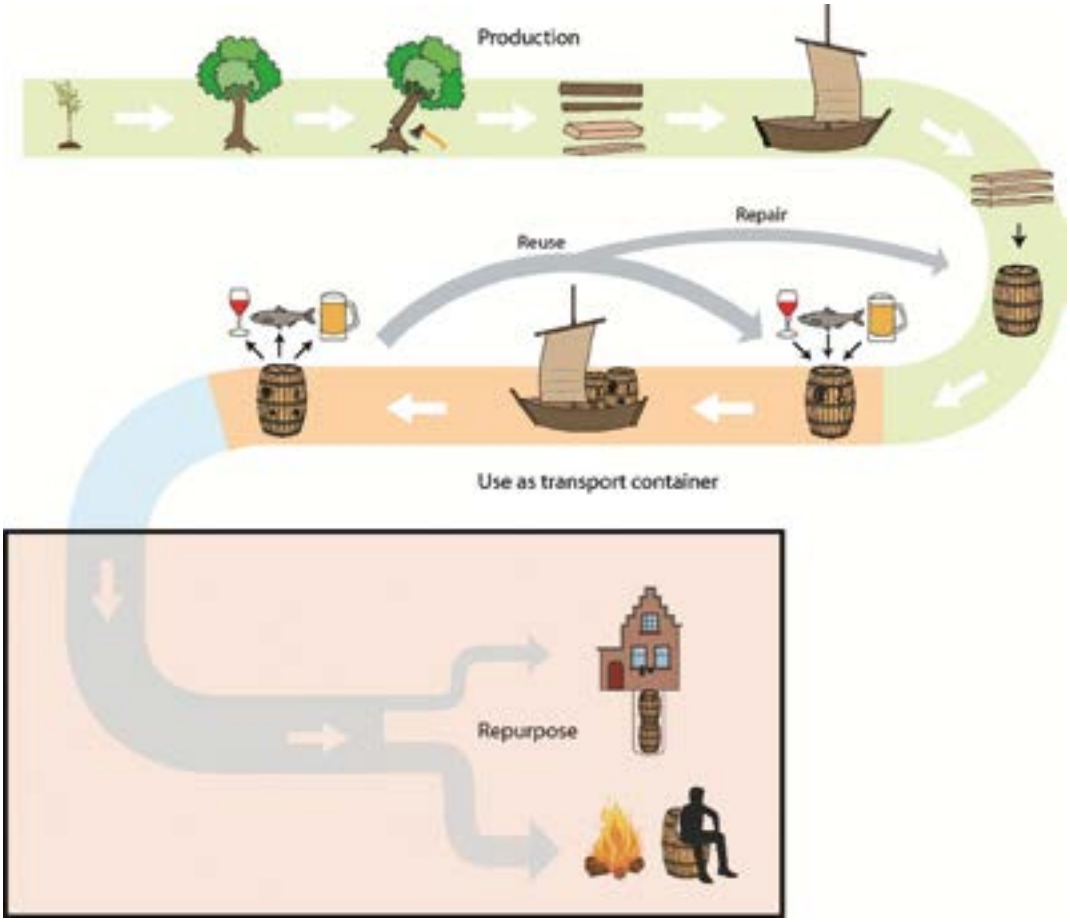

Figure 6.1: Schematic overview of the lifecycle of a cask. Production phase – green; its use as a transport container – orange; repurposing – blue. The frame highlights the part of the casks' lifecycle that is discussed in this chapter.

6.1.1 Repurpose practices of casks

Casks were employed in a broad variety of repurpose practices. They were, for instance, transformed into household furniture such as chairs and tables (Figure 6.2_1, 2) and frequently served as storage containers in homes. Beyond domestic settings, casks were also repurposed in maritime contexts, as buoys to mark underwater hazards or navigational routes critical to shipping and trade. In the fishing industry, casks served as effective flotation devices for fishing nets, a technique common especially in the operation of herring fleets (Figure 6.2_3). Through the wide range of repurposing possibilities, casks became a common feature in the streetscape of the Late Middle Ages and Early Modern period.
Even if casks were dismantled, their individual parts were not discarded. Staves were repurposed for various purposes in urban environments, for example, for frameworks for fences or flooring (Figure 6.2_4). Eventually, when no other use was viable, the wooden remnants of casks could be used for firewood.

Figure 6.2: Examples of repurposed casks: 1. A cask used as a table; 2. Casks used as chairs; 3. Casks used as flotation devices for fishing nets; 4. Staves repurposed as flooring. Sources: 1. Merry company of peasants playing music, smoking and drinking [Oil on canvas, private collection], by Bartholomeus Molenaer, 1640–1650. Database RKD Netherlands Institute of Art History, https://rkd.nl/images/298401; 2. Company drinking and smoking in an interior [Oil on canvas, private collection], by Jan Molenaer, 1669–1702. Database RKD Netherlands Institute of Art History, https://rkd.nl/images/259744); 3. Shipping in calm waters [Oil on canvas, private collection], by Willem Van Diest, 1629–1668. Database RKD Netherlands Institute of Art History, https://rkd.nl/images/257584); 4. Oosterbaan & Griffioen, 2015, 85.

The best-known repurposing of casks in archaeology is their use as shafts of cesspits and water wells (Figure 6.3). The heads of the casks were removed, and then the casks were stacked vertically to form the shaft. In this way, casks took on a structural function as part of a construction technique. During installation, the casks also functioned as a temporary casing; digging was done from inside the cask, thus gradually the cask shaft was sunk deeper into the ground, and more casks were added vertically during the process. The shaft could thus be dug to the required depth with minimal surface disturbance and significantly reducing the risk of collapse during digging. Archaeological remains of cask shafts often exhibit only a narrow cut in the soil, significantly smaller than the wide pits associated with brick-lined cesspits and water wells.[219] Due to the favourable soil conditions in the Netherlands, typically waterlogged, these wooden structures have been well preserved and have been systematically recorded by archaeologists.

Figure 6.3: An example of three repurposed casks that form a cesspit, Vlissingen, dated between 1425 and 1525. Left: the exterior view of the casks; right, the contents of the cesspit (Oosterbaan & Griffioen, 2015, 355).

219 Van Oosten, 2015, 85.

6.1.2 Research design

Although considerable research has been conducted on cesspits and wells,[220] no systematic comparison between cask-lined shafts and their brick-lined counterparts has been undertaken in the Netherlands. As a result, the factors that influenced the choice between the two types of lining remain unclear.

Van Oosten, in a comprehensive study focused on cesspits, put forward several preliminary hypotheses.[221] One key consideration may have been financial. Repurposed wooden casks likely involved lower material costs and, since installation took less time, labour costs would have been less as well.[222] Additionally, soil conditions likely played a role. In areas with unstable or marshy subsoil, cask-lined shafts would have provided a safer working environment because of the reduced risk of the soil collapsing. Another plausible explanation for the choice of cask lining is the ready availability of discarded casks that could be repurposed. In cities where such casks were abundant, this option may have been favoured due to convenience and lower cost.

In this chapter, a case study approach is taken in an examination of the construction of cesspit and water well shafts. The case study is focused on the city of Vlissingen. Three key factors are examined: soil conditions, economic considerations, and availability of material. The research question asks what factors determined the choice between bricks and repurposed casks in the construction of cesspits and water wells in urban Vlissingen during the Late Middle Ages and Early Modern period.

This study was carried out as a single-city case study to eliminate confounding effects from differences in construction practices, regulations, and environmental conditions between cities. Van Oosten's study demonstrated that urban authorities issued specific regulations regarding the management of waste and human excrement, for example, Haarlem's regulations aimed at protecting urban waterways.[223] Construction practices also varied between cities. In 's-Hertogenbosch and Dordrecht, for example, cesspits and cellars were often designed to serve multiple households living on one parcel of land, where large, rectangular pits or cellars were constructed.[224] In addition, relatively few cesspits have been found in inland cities compared to coastal cities. This may be because human waste held greater economic value for farmers in the areas around inland cities. Differences in subsoil conditions, ranging from stable sandy soils to marshy clay or peat, could also have significantly impacted how cesspits were built. By limiting the scope of research to one city, a more controlled analysis is possible.

220 Baart, 1982, 1983; Baart et al., 1986; Bartels, 1999; Sarfatij, 1999, 2007; Thijssen, 1985; Van Oosten, 2015.

221 Van Oosten, 2015.

222 Van Oosten, 2015, 83–84.

223 Van Oosten, 2015, 130.

224 Van Oosten, 2015, 326.

Vlissingen was chosen because of its economic and material conditions. As a major trading port with a thriving herring fishery and active coopers' guild, and playing a key role in the distribution of goods to Antwerp, Vlissingen had an abundance of casks. This is reflected in a relatively high number of both brick-lined and cask-lined cesspits and water wells that have been uncovered in Vlissingen. The combination of socioeconomic context and diverse archaeological evidence makes Vlissingen a good place to explore the repurposing of casks in an urban setting.

In recent decades, three large-scale archaeological excavations have been carried out in different parts of Vlissingen's historic city centre from which well-documented data is available. The excavations are known by the toponyms Groote Markt,[225] Spuistraat,[226] and Dokkershaven.[227] The excavations were done in various areas of the city and include several phases of the city's expansion. This ensures that the dataset is balanced. Finally, an investigation of several locations makes it possible to examine small but significant differences in soil conditions across Vlissingen.

Dataset

The dataset consists of all features identified as *beerput* (cesspits), *waterput* (water wells), and *tonput* (barrel wells) from the excavations at Groote Markt, Spuistraat, and Dokkershaven (Table 6.1), but only features with a circular shape were selected for this case study. For each feature, the dataset includes the exact location of the feature, extracted from the excavation data such as trench and feature number; height data, specifying the highest and lowest documented levels; and a date, based on the dating of the artefact assemblage found in the feature.

The identification, whether cesspit or water well, is also recorded. Features initially classified as "barrel well" in the dataset have been reassigned either to the cesspit or water-well category for this case study, based on excavation and contextual data. The construction material, whether cask or brick, is also noted for each shaft. In some cases, hybrid constructions were observed where the upper part of the shaft was made of brick and the lower segment with one or more casks.

For features with cask linings, the dataset also includes detailed measurements of the individual casks used, height, maximum diameter, and minimum diameter. The final dataset comprises 226 entries. The following table shows the number of records related to each excavation.

225 Oosterbaan & Griffioen, 2015.

226 De Boer et al., 2010.

227 Claeys et al., 2010.

Table 6.1: Number of cesspits and water wells per excavation.

Toponyms excavation	Number cesspits	Number of water wells	Total	Surface excavated
Vlissingen Groote Markt	72	51	123	5705 m2
Vlissingen Spuistraat	15	10	25	2851 m2
Vlissingen Dokkershaven	31	47	78	10000 m2
Total	**118**	**108**	**226**	**18556 m2**

Vlissingen Groote Markt

The excavation at Groote Markt was carried out by Archaeological Research and Consultancy (ARC BV) in two phases in 2011 and 2012. The research area was divided into three areas, identified as areas A, C, and E with a combined excavation area of 5,705 m² (Figure 6.4).

These areas are located in the western part of Vlissingen's historic city centre. The southernmost area (C) lies directly along the Groote Markt and was first developed for residential use in the 14th century. The other two areas (A and E) are situated near the outer edge of late medieval Vlissingen and were not settled until the 16th century.

For many of the land parcels excavated, tax records are available from registers dating from 1580. These records show that property owners of areas A and E were taxed 1% of the assessed value, offering valuable insight into the relative value of the properties at that time.[228]

Vlissingen Spuistraat

The excavation Spuistraat was conducted by ADC ArcheoProjecten in several phases between November 2004 and February 2005. In total, 2,851 m² of surface area was investigated (Figure 6.4).

The excavation took place in the heart of the historic city centre. Remains of residential structures were uncovered dating back to the early 15th century, as well as remains of Vlissingen's former harbor and the Sint-Jacobskerk and adjacent cemetery.[229]

228 Oosterbaan & Griffioen, 2015, 52. Details of the Vlissingen Groote Markt excavation are from Oosterbaan & Griffioen, 2015.

229 De Boer et al., 2010, 242. Details of the Vlissingen Spuistraat excavation are taken from De Boer et al., 2010.

Vlissingen Dokkershaven

The excavation Dokkershaven was carried out by ADC ArcheoProjecten during the winter of 2007–2008, near the Dokhaven. It was by far the largest of the three investigations, covering a total area of approximately 10,000 m² (Figure 6.4).

This excavation was conducted outside of the 16th-century city centre. The area only became part of Vlissingen following the eastward expansion of the city at the end of the 16th century. Most of the buildings within the excavation area were constructed between 1609 and 1614, when a new harbor (Dokhaven) was developed on the east side of the city.[230] The excavation uncovered parts of the dock lock and adjacent warehouses. In addition, remnants of three churches with graveyards were found. The site also revealed building remains dating from the 17th century onwards, both worker housing and residences of prominent citizens.[231]

Figure 6.4: Excavation sites projected onto a current topographic map of Vlissingen.

230 Claeys et al., 2010, 37.

231 Details of the Vlissingen Dokkershave excavation are taken from Claeys et al., 2010.

Chronology of dataset

Of the 226 cesspits and water wells investigated, 180 could be dated, primarily based on datable finds recovered from the features (Table 6.2). In some instances, relative dating methods were also applied, relying on the spatial relationship between the feature in question and other dated features. This information was used to establish a detailed chronology, which has been incorporated in the dataset.

In the other 46 records, no detailed chronology could be established due to several reasons. In some cases, no datable finds were available because the features had been emptied at some point. This practice occurred relatively frequently in Vlissingen, where in particular cesspits, attracted the attention of people outside the archaeological community hoping to find items of value. In addition, it is possible that certain features received less attention from archaeologists due to the sheer volume of features and materials uncovered. In the selection process, these features were excluded from thorough investigation.

The following table presents an overview of the initial dating of cesspits and water wells from the dataset, grouped into half centuries. The focus is on the starting date, as this case study aims to investigate the factors that influenced decisions to construct cesspits and wells.

Table 6.2: Number of cesspits and water wells, by construction date.

Context dates	Number of cesspits and water wells
1300–1349	1
1350–1399	0
1400–1449	7
1450–1499	6
1500–1549	40
1550–1599	42
1600–1649	54
1650–1699	6
1700–1749	4
1750–1799	2
1800–1849	13
1850–1900	5
No context date	46
Total	**226**

Source criticism

The combined area of the three Vlissingen excavations is only a small portion of the historic city centre. Of the area within the earlier city limits of Vlissingen in 1550, in which the Groote Markt and Spuistraat are located, approximately 5.5% has been excavated. Within the later city limits, expanded in the late 16th and early 17th centuries, within which Dokkershaven is located, the overall percentage of area excavated is about the same (5.4%). The relatively small area in the historic city that is under investigation ensures a selective dataset, excluding features from the parts of the city that were not excavated.

Vlissingen's strategic location in the maritime landscape makes it a particularly suitable city for this case study. Due to its maritime and strategic location on the Western Scheldt, Vlissingen maintained strong trade links with Antwerp. This likely meant that residents of Vlissingen had easier access to discarded casks than those of inland cities. Additionally, the soil conditions in Vlissingen differ markedly from those in many other cities. Marine sediment created a relatively unstable subsoil, which may have encouraged the use of cask shafts, which could be quickly installed, rather than labor-intensive brick.

Vlissingen presents a rich opportunity for study because it has a relatively high number of cask-lined shafts compared to other urban sites. This abundance allows for a meaningful comparison between cesspits and water wells with cask-lining and those with brick-lining within a single urban context.

6.2 Vlissingen

This section provides a brief overview of the relevant soil conditions in Vlissingen, after which the city's historical development is briefly sketched.

6.2.1 Soil conditions in Vlissingen

The soil composition of the historic city centre of Vlissingen was formed by sediment deposits during four geological periods. The sediments are not uniformly distributed across the wider area and occur at varying depths, resulting in variations in soil conditions in the historic centre and the excavation sites.

During the Pleistocene era, sand was deposited at what is now Vlissingen. At the beginning the Holocene era the land surface was significantly lower, with the coastline far to the west, beneath what is now the North Sea. As sea levels rose throughout the Holocene era, coastal margins became submerged, increasing groundwater saturation. This gradual saturation fostered optimal conditions for peat development, known as *basisveen*, in the low-lying areas.[232]
A second layer of sediment began forming around 5500 BCE, when the upper

232 Silkens & Meijlink, 2023, 10.

Pleistocene sands, sometimes overlain by *basisveen*, were eroded by tidal channels and marine flooding. The resulting marine sediment, are classified as the *Laagpakket van Wormer*, and ceased forming around 2000 BCE.

The third layer consists of peat that accumulated after the coastline formed around 2000 BCE, reducing marine effects. During the subsequent 1,500 years, the *Hollandveen Laagpakket* developed over a large area.[233]

From the Roman period onwards, the sea again exerted its forces on the area that would later be the historic centre of Vlissingen. This was due to two reasons: subsidence of the land surface caused by drainage and a gradual rise in sea level. The landscape evolved into a tidal environment where channels repeatedly cut into the terrain and eroded existing peat layers. These successive sedimentary phases are classified as the Laagpakket van Walcheren.[234] Over time, these creeks were filled with sandy sediment, which was less compacted than the surrounding peat-rich soils. As a result, the former creek beds formed slightly elevated ridges in the landscape, making them attractive locations for early human settlement.[235]

A series of these former creek beds extends in a north-south direction bordering what would later become the western part of Vlissingen's historic city centre (Figure 6.5 creek beds). This geomorphological feature may have played a significant role in the establishment of the early settlement that eventually developed into the town of Vlissingen. After the creek had filled with relatively sandy sediments, the location provided a slight elevation and more stable ground conditions, making it especially favourable for early habitation and construction.

A channel was probably still open during the Late Middle Ages and played an important role in the emergence of Vlissingen. It ran in a north-south direction through the western part of the historic city centre (Figure 6.5 channel). At the end of the Late Middle Ages, it was filled in to prepare ground for the urban expansion of Vlissingen. Initially, it silted up naturally and later it was further levelled off anthropogenically with backfill.

As a result of both natural and anthropogenic processes, the soil conditions in Vlissingen's historic city centre vary. The three archaeological excavations are located across these differing sub-strata. In the eastern sector, Dokkershaven and Spuistraat lie within a peat-rich area. The southern part of Groote Markt is located within a former tidal channel, artificially filled in, causing a less stable sub-strata. The northern trenches of the same site are situated on former creek beds with relatively sandy, and thus more stable soil (Figure 6.5).

233 Formatie van Nieuwkoop, Vos & Van Heeringen, 1997; Silkens & Meijlink, 2023, 10.

234 Formatie van Naaldwijk, Vos & Van Heeringen, 1997.

235 Silkens, 2008, 10.

Figure 6.5: Soil conditions in and around the historic city centre of Vlissingen.

6.2.2 Development of Vlissingen

The earliest traces of medieval settlement in Vlissingen are in an area north of the current city centre, on the eastern side of a creek bed that was filled with water until the Late Middle Ages. The area, known as Oud-Vlissingen, likely developed around a natural harbor. As ship sizes increased and the natural harbor silted up, the creek became less navigable, prompting the growth of a new settlement further south, later known as Nieuw-Vlissingen, or simply Vlissingen.

The development of Vlissingen is linked to Count Floris V who visited the area in 1290 and purchased the land in 1294.[236] The area attracted settlers because of the possibility of peat exploitation and herring fishing, both important for the town's early economy.[237] In the 14th and 15th centuries, the town expanded, the Sint-Jacobskerk was built, and dikes and harbors (e.g., Koopmanshaven and Achterhaven) were constructed. By 1417, the town had around 500 inhabitants (Figure 6.6).[238]

236 Dommisse, 1910, 55–63.

237 De Boer et al., 2010, 36.

238 Brusse & Mijnhardt, 2012, 216.

Figure 6.6: Three excavations placed in the 1550 map of Vlissingen (projected on: map of Vlissingen by Jacob van Deventer, dated 1550, ZA, ZI, 364).

From the late 15th to the 16th century, Vlissingen benefited from trade with Antwerp and Bruges. A third of Antwerp's goods passed through Walcheren, and thus Vlissingen's deep harbor proved to be a key logistical advantage for transportation. The 1530 storm surge improved navigability via the Westerschelde, which further boosted the town's economic role. In response, Fort Rammekens was built nearby in 1547.[239] Vlissingen's population continued to increase; in 1500 it had around 1,000 inhabitants, and by 1550 this number had tripled to 3,000.[240]

Political shifts also affected Vlissingen positively. In 1571, Spanish forces occupied the town and began building a citadel, but they were expelled in 1572 by the local population. William of Orange rewarded this rebellion by lifting trade restrictions and allowing harbor expansion.[241] Major urban changes followed, including fortifications and new harbor infrastructure.

The fall of Antwerp in 1585 brought wealthy Protestant refugees to Vlissingen, along with trade links and economic activity. That same year Vlissingen was

239 Brusse & Mijnhardt, 2012, 240.

240 Druenen, 2015, 171.

241 De Ridder, 2004, 14–15.

pledged to England as a strategic ally, and an English garrison was stationed in the city.[242] Control over the Westerschelde gave Zeeland control over regional trade routes.

At the beginning of the 17th century, the city expanded significantly to the east. During the Twelve Years' Truce (1609–1621), fortifications were reinforced and new harbors were constructed (e.g., Dokhaven), doubling the size of Vlissingen (Figure 6.7).[243] By this time, the population had increased to 7,000. But from the second quarter of the 17th century onwards, the city's growth began to stagnate. The fishing industry declined, but pri*vat*eering increased. In the years that followed, ongoing maritime conflicts and foreign wars further stymied Vlissingen's development.

Figure 6.7: Three excavations placed on the 1648 map of Vlissingen (projected on: map of Vlissingen by Willem Janszoon Blaeu, dated 1648, ZA, ZI, 379).

The French Revolution at the end of the 18th century had a profound impact on Dutch society, and its effects in Vlissingen were acute. In 1795, France was granted the right to station a garrison in the city. By 1804, a French fleet was based in Vlissingen's harbors, in preparation for an invasion of England. In response, a

242 Claeys et al., 2010, 36.

243 Claeys et al., 2010, 36.

British expedition bombarded the city in 1809, destroying much of its historic centre.[244] This marked the end of Vlissingen's prominence in the Early Modern period.

6.3 Results

In what follows, the results of this case study of repurposed casks are presented in four sections. First, the use of casks versus bricks as lining for cesspits and water wells is discussed. Then the three key factors are addressed: economic considerations, soil conditions, and the availability of construction material.

6.3.1 The chronological distribution of cesspits and water wells

An initial overview of the dataset of the excavation sites revealed that out of a total of 226 features, 118 were interpreted as cesspits and 108 as water wells (Table 6.3).

The features were also examined chronologically, beginning with the start date of their context dating. These dates were grouped into 50-year periods, which shows that the majority of features were constructed between 1500 and 1649. During this period, 136 (76%) of the 180 dated features were built (Table 6.3). This time period corresponds to the period during which Vlissingen was thriving, that is, from the late 15th century to the second quarter of the 17th century (Section 6.2.2).

The relatively limited occurrence of cesspits during the Late Middle Ages has also been observed in other Dutch cities. Van Oosten demonstrated that in cities such as 's-Hertogenbosch and smaller emerging towns in the Netherlands, the widespread use of cesspits did not begin until the Early Modern period.[245]

The increase in the number of cesspits in the Early Modern period, which is also evident in the Vlissingen dataset, is commonly attributed to rising population levels and population density. Haarlem, for example, grew significantly in the first half of the 16th century, and the number of cesspits increased accordingly.[246] A similar correlation is evident between population growth and the number of water wells. In the late medieval fishing village of Raversijde (Belgium), for example, archaeological research uncovered a large number of cask-lined water wells, most of which date to the period of prosperity in the first half of the 15th century.[247] The data from Vlissingen also indicates a correlation between the rise in the number of cesspits and water wells and an increase in population.
Beginning in the second half of the 17th century, the rate of new cesspits and water wells being constructed in Vlissingen declined significantly. Only 30 of the

244 Brusse & Mijnhardt, 2012, 240.

245 Van Oosten, 2015, 189.

246 Van Oosten, 2015, 160, 162.

247 Houbrechts & Pieters, 1996, 254–255.

180 dated features, just 17%, were constructed during this period (Table 6.3). The same held true for Leiden.[248] This decline is often attributed to regulatory measures imposed by urban authorities, for example, the construction of a sewer system during the 1659 urban expansion of Leiden.[249] There was likely a comparable development in Vlissingen, related to urban ordinances starting in 1637 that implemented urban consolidation and initiated a shift to brick structures.[250]

Table 6.3: Number of cesspits and water wells, by construction date.

Context dates	Cesspits	Water wells	Total
1300–1349	1	0	1
1350–1399	0	0	0
1400–1449	5	2	7
1450–1499	6	0	6
1500–1549	30	10	40
1550–1599	26	16	42
1600–1649	30	24	54
1650–1699	0	6	6
1700–1749	2	2	4
1750–1799	2	0	2
1800–1849	5	8	13
1850–1900	1	4	5
No context date	12	34	46
Total	**118 (52%)**	**108 (48%)**	**226 (100%)**

The distribution of cesspits and water wells with cask-lining and brick-lining
The dataset includes a total of 118 cesspits, of which 102 (86%) are constructed with casks. The remaining 15 cesspits are built with brick. In one exception, both materials are used, a brick-lined upper section, beneath which at least one cask (perhaps more) had been placed (Table 6.4).

The pattern differs for water wells. Of the 108 water wells only 46 (42%) are cask-lined. The majority of the water wells, 55%, have brick-lining, indicating a preference for bricks. As with cesspits, only a few examples (3%), combine brickwork and casks (Table 6.4).

Table 6.4: Number of cesspits and water wells with brick and cask lining, by construction date.

248 Van Oosten, 2016, 7–8.

249 Van Oosten, 2015, 197.

250 Oosterbaan & Griffioen, 2015, 54.

Context dates	Cesspit, brick-lined	Cesspit, cask-lined	Cesspit, brick and cask-lined	Cesspit total	Water well, brick-lined	Water well, cask-lined	Water well, brick and cask-lined	water well total	Total
1300–1349	1	0	0	1	0	0	0	0	1
1350–1399	0	0	0	0	0	0	0	0	0
1400–1449	0	5	0	5	1	1	0	2	7
1450–1499	1	5	0	6	0	0	0	0	6
1500–1549	4	26	0	30	0	10	0	10	40
1550–1599	0	25	0	25	3	13	0	16	41
1600–1649	5	25	0	30	11	12	1	24	54
1650–1699	0	0	0	0	2	3	1	6	6
1700–1749	1	1	0	2	2	0	0	2	4
1750–1799	1	1	0	2	0	0	0	0	2
1800–1849	1	3	1	5	5	3	0	8	13
1850–1900	1	0	0	1	3	1	0	4	5
No context date	0	11	0	11	32	3	1	36	47
Total	**15**	**102**	**1**	**118**	**59**	**46**	**3**	**108**	**226**

The material used for the construction of cesspits and water wells varies significantly between cities, reflecting distinct regional practices. Van Oosten's research of cesspits reveals notable differences in construction material in both inland and coastal regions, specifically in 's-Hertogenbosch, Deventer, and Amersfoort (inland), and Haarlem, Leiden, Alkmaar, and Dordrecht (coastal).[251]

In the inland city of Amersfoort, the total number of documented cesspits is relatively low. Of these, approximately 80% are constructed with bricks and only

251 Van Oosten, 2015.

20% with wood.[252] A particular feature of Deventer's cesspit record is the presence of roof-tile cesspits in 12% of the excavated examples. The cesspit assemblages of the coastal cities of Haarlem, Leiden, and Alkmaar, however, show a high degree of consistency. Nearly all cesspits are constructed of brick.[253]

Dordrecht deviates markedly from the general coastal pattern. The use of wood as cesspit construction is much more common. In both the 13th–14th and 15th–16th centuries, 72% of the cesspits were constructed with wooden linings.[254] The occurrence of cask-lined cesspits in Vlissingen most closely resembles the situation in Dordrecht. In fact, the percentage is even higher than that of Dordrecht; 86% of all cesspits in the dataset have cask lining. Van Oosten attributes such regional variation to several factors: the local availability of building materials, soil conditions, and the financial means of the property owner.[255] These factors will be addressed in turn in the following sections.

6.3.2 Soil conditions

One of the factors that may have influenced the choice between cask and brick lining is the soil condition. Unstable soil is commonly cited as an explanation for cask lining. In Dordrecht, for example, as mentioned above, a large proportion of cesspit linings were casks. The shafts there were often dug into layers of filled and disturbed soil, several meters thick, resting on peat-rich sediments.[256]

The soil conditions in Vlissingen are similar to those in Dordrecht. This may help to explain the widespread use of cask-lined cesspits (86%) and water wells (42%) in the city. Vlissingen, however, provides an opportunity to investigate the influence of soil conditions in more detail, as there are notable variations in the soil conditions within the historical city centre.

As shown in Figure 6.5, three zones with distinct soil conditions can be identified. The first zone is in the western part of the historic city centre, where archaeological excavations at Groote Markt have revealed sediments that were deposited in former creek beds (Figure 6.5). The resultant sandy subsoil has a greater stability and load-bearing capacity than soil in other parts of the city. A relatively high amount of brick lining might be expected there. The lower risk of subsidence associated with the sub-strata did, in fact, would have made brick lining feasible despite its longer construction time.
The second zone is characterized by the soil of a former channel that ran through the city centre until the Late Middle Ages (Figure 6.5). The channel was likely filled in toward the end of that period to make way for Vlissingen's urban development,

252 Van Oosten, 2015, 67.

253 Van Oosten, 2015, 65.

254 Van Oosten, 2015, 71.

255 Van Oosten, 2015, 72.

256 Van Oosten, 2015, 71; Sarfatij, 2007, 47–93.

during which the harbor facilities were relocated (Section 6.2.2). The archaeological excavation at Groote Markt revealed unstable soil conditions in this zone, which leads to the expectation of a higher concentration of cask-lined cesspits and water wells.

The third zone is located in the eastern half of the historic city centre, where Spuistraat and Dokkershaven are located (Figure 6.5). In these excavations, peat-rich sediments were encountered. The stability and load-bearing capacity of this subsoil can be considered average compared to the other two zones. The distribution of cask-lined and brick-lined cesspits and water wells was, therefore, expected to be close to the citywide average.

Although a lower than average occurrence of cask-lined cesspits was expected in the creek-bed zones, the opposite is the case. In that zone, 94% of the cesspits have cask linings, compared to the citywide average of 86% (Figure 6.8). Similarly, the peat-rich region in the eastern part of the historic city centre shows higher-than-average numbers, with 96% of cesspits having cask lining. In contrast, the area of the former channel that was filled in, with its unstable soils and low load-bearing capacity, which led to an expectation of a high number of cask-lined cesspits, actually has a lower than average number of cask-lined cesspits, just 77%.

This distribution, deviating from initial expectations, may indicate that the differences in soil conditions did not in any major way affect the choice of cask or brick lining. It is possible that the variations in the local subsoil of Vlissingen, compared to other cities, were relatively minor and that factors such as availability of construction material, construction traditions, and economic considerations had a greater influence on the construction of cesspits.

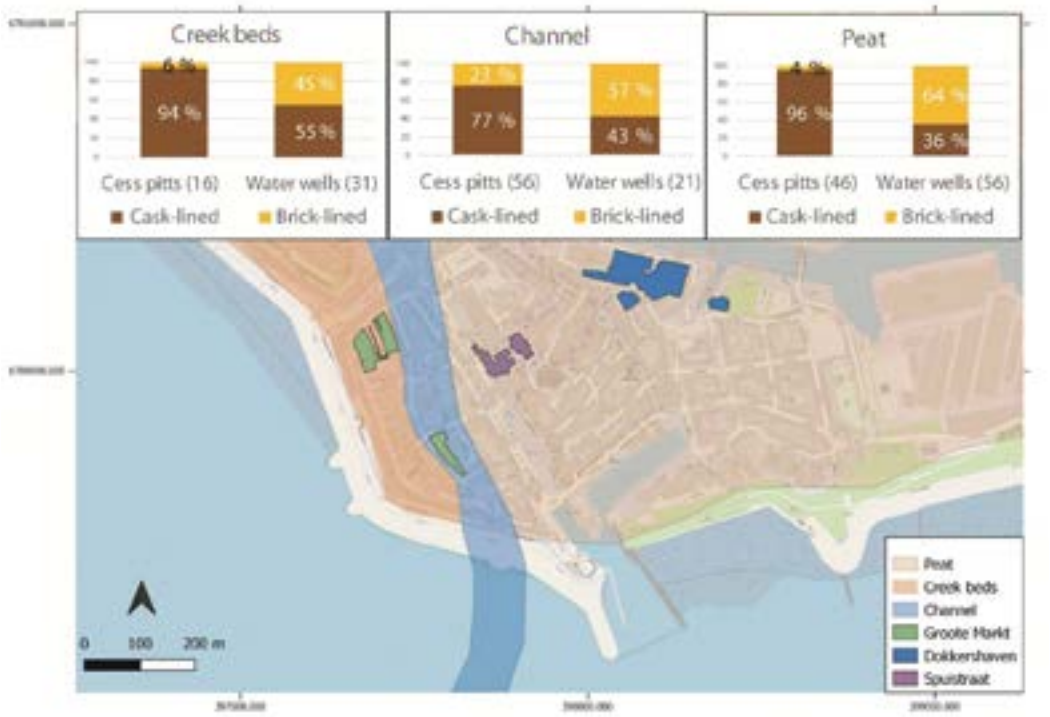

Figure 6.8: Percentages of cask-lined cesspits and water wells in the region with creek beds, former channel, and peat area projected onto a map of soil conditions in and around the historic city centre of Vlissingen.

The distribution of cask-lined and brick-lined water wells in the dataset does not align with initial expectations either (Figure 6.8). In the creek-bed sediment, relatively stable soil with a high load-bearing capacity, cask-lined wells make up 55% of the total, well above the citywide average of 43%. In the unstable fill of the former channel, the percentage of cask-lined water wells is similar to the city average. Interestingly, although it was in the peat-rich sediments that a higher-than-average use of cask-lined wells was expected, only 36% of the wells had cask lining.

Regional variations in soil conditions may also have affected the groundwater level, a crucial factor in the construction of water wells. To investigate this, the average depth of the wells in the three zones were compared. Notably, the average maximum depth of wells in the creek-bed sediment and the peat-rich subsoil are similar, approximately 0.5 m and 0.4 m below NAP (*Normaal Amsterdam Peil*). In contrast, wells in the channel zone (fill) reach an average depth of 1.1 m below NAP, up to 0.7 m deeper. The fact that the channel was filled in at the end of the Late Middle Ages could mean that the soil had become more water permeable, resulting in a significantly lower groundwater table. It seems likely that the required depth of a well would have influenced the construction method and the choice of material used.

In conclusion, neither the percentage of cesspits with cask lining nor that of water wells with cask lining in the dataset reveal any clear patterns related to soil conditions. Neither does the distribution of cesspits and water wells across the zones present a consistent picture. In the peat-rich region in the eastern part of the historic city centre, cask-lined shafts were expected to be similar to the citywide average. However, the number of cesspits exceeds this average while the cask-lined water wells occur less frequently than expected. This may indicate that soil conditions in Vlissingen had only a limited influence on the choice of construction materials for cesspits and wells and that other factors played a more significant role.

6.3.3 Economic considerations

Certainly one important factor in the choice of lining would have been the financial means of the property owner. If construction was to be undertaken, a financial investment was required. Choice of material would be closely tied to the owner's resources.

Studies of Dordrecht have observed that cask-lined cesspits and water wells are common in the outskirts whereas in the city centre, brick-lined shafts were constructed in greater number. One explanation for this is relative financial means. In the poorer districts of Dordrecht, there appears to have been a preference for the more economical cask lining.[257]

Written sources rarely provide detailed information on the cost of constructing wells. One exception is the will of Bommenee (c. 1685–1757), who was the head of public works in the town of Veere, about 15 kilometers from Vlissingen.[258] In his will, he noted detailed information about water-well construction costs, based on first-hand experience and direct obser*vat*ion. His notes provide a rare and valuable insight into the materials and cost involved in building freshwater wells during this period (Table 6.5).

257 Bartels, 1999, 27; Van Oosten, 2015, 72.

258 Van Oosten, 2015, 84.

Table 6.5: Construction costs of a water well, taken from the will of Bommenee (c. 1685–1757) from Veere..

Building material of water well	**Building material of water well (Dutch)**	**Diameter (m)**	**Depth (m)**	**Cost (*f*)**	**Cost of extending**
3,400 new IJssel bricks and trass with Doornik lime	*3400 nieuwe IJs-selsteen en tras en Doornikse kalk*	1.04	3.55	43.20	+ 1.78 m costs *f* 54.30
825 half-size grey bricks, lime, and trass	*825 halve grauwe mopsteen, kalk en tras*	0.89	3.55	25.35	Cask 5, *f* 3.00, Cask 6, *f* 3.60, Cask 7, *f* 4.20, Cask 8, *f* 4.80
975 repurposed bricks, along with lime and coal ash	*975 oude moppen + kalk en koolas*	1.04	3.55	14.85	
4 wooden casks (hogsheads of 222 liters each)	*4 houten tonnen (oxhoofden à 222 l)*	1.04	3.55	16.80	

This list of the costs reveals a significant difference in expenses depending on the construction material used. A brick-lined water well cost 43.20 guilders, approximately two and a half times more than a water well constructed entirely from casks, which costs only 16.80 guilders. The document also records a hybrid well, built using both bricks and casks, which cost 25.35 guilders, approximately halfway between the two. The cost estimate is specifically for 18th-century Veere. Notwithstanding diachronic and regional variations, the list provides a general indication of the relative cost that might be expected. It is clear that the choice of building material had a substantial impact on overall construction costs. This disparity is likely not only related to the investment in materials but also reflects differences in labor costs and the time required for construction. A cask-lined well would have been significantly quicker and easier to construct than a brick-lined one.

Certain items in Bommenee's will are labeled as repurposed or new, such as "975 old bricks" or "3,400 new IJssel bricks" (Table 6.5). Though it is not explicitly stated, it seems likely that the casks he listed were repurposed and not specifically made to be used as shaft linings. This is also evident from the marks frequently found on casks that were used as lining. Besides the coopers' mark, there would be no reason to mark a cask as specifically produced as shaft lining material.

To determine whether financial means influenced the choice of lining, the dataset from Vlissingen proved useful. An initial question is which parcels of land in Vlissingen were owned by relatively wealthy residents and whether they had a preference for brick lining or repurposed casks. A logical step would be to analyze the spatial distribution of cesspits and water wells across the wealthier and poorer neighborhoods of Vlissingen. However, there was relatively little social segregation in Vlissingen during the research period; wealthy and poor residents often lived

side by side,[259] with no clearly defined rich or poor neighborhoods. Comparison of construction materials across the several excavations offers limited insight into the choice of lining in relation to financial means. The intermingling of social classes within the same area makes it difficult to draw meaningful conclusions about the spatial distribution of features across the three excavation sites.

In order to draw a reliable picture of financial means, only data from Groote Markt was used because of the availability of useful data. For the period 1575–1625, detailed data on financial means is available from archaeological findings and historical records, including tax assessments from 1580[260] and mortgage information for some parcels.[261] These three sources of information were used to classify the financial means of the residents of parcels excavated at the Groote Markt.[262] The 1824 cadastral map was used as a reference for the spatial layout, which has remained largely unchanged since the late 16th century.[263]

Cesspits and water wells dating between 1575 and 1625 were identified based on the initial dating of the artefacts recovered from them (Table 6.6). Only features from between those dates were included in the analysis because specific data on the financial means of the parcel owners are available for this period. In order to examine the spatial distribution of these features in relation to the financial classification of the associated properties, they were plotted onto the corresponding parcels (Figure 6.9, Figure 6.10).

Table 6.6: Number of cesspits and water wells (1575–1625) uncovered at the Groote Markt in Vlissingen, by lining type.

Feature type	Cask	Brick	Combined	Total
Cesspits	19	5	0	24
Water wells	14	10	1	25
Total	**33**	**15**	**1**	**49**

259 Brusse & Mijnhardt, 2012, 11.

260 In 1580, taxes of 1% were levied based on the assessed values of real estate to finance government expenditures, which during this phase of the Eighty Years' War were likely directed toward war-related costs. In Vlissingen, real estate was assessed using a system of predefined categories; parcels were not individually valued but assigned to specific classifications. ZA DOMM: Afschrift van het "Quohier" van taxatie van de 100en penning van de huizen en de erven binnen der stede van Vlissingen (Toeg. 71 invnr 4).

261 ZA, RAZE No. 118/750, 1610–1808. https://www.zeeuwsarchief.nl/onderzoek-het-zelf/archief/?mivast=239&mizig=435&miadt=239&milang=nl&mif1=3306614547&mizk_alle=Venisstrate

262 Oosterbaan & Griffioen, 2015, 59. A total of 49 parcels were examined during the excavation, which have been categorized as below average (n=30), average (n=13), or above average (n=5) in terms of financial means.

263 Oosterbaan & Griffioen, 2015, 59.

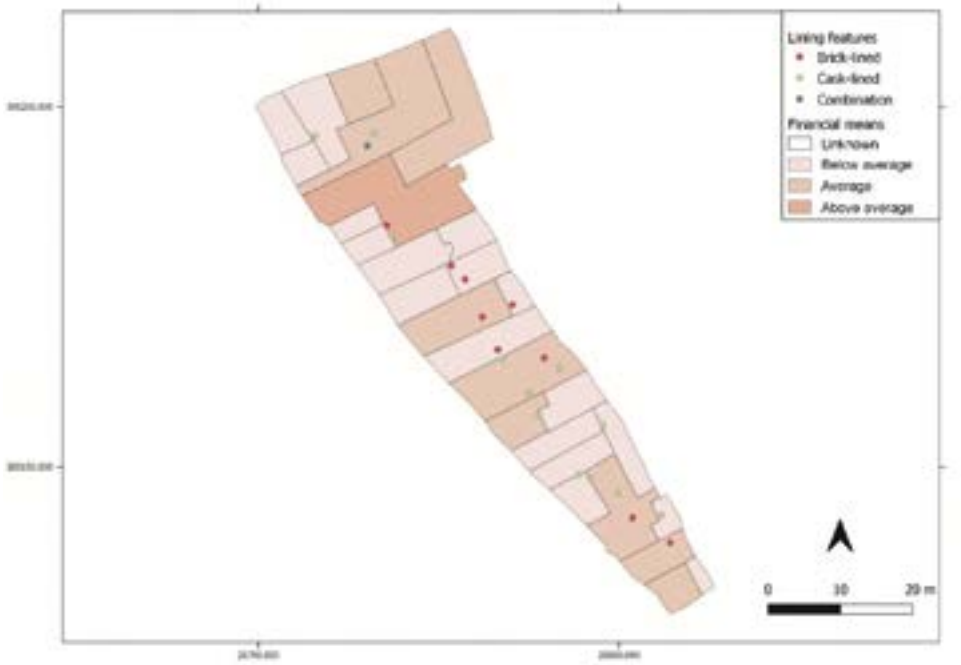

Figure 6.9: Distribution of cask and brick lining of cesspits and water wells in the southern part of the Groote Markt excavation in Vlissingen mapped onto the parcels in which they were found.

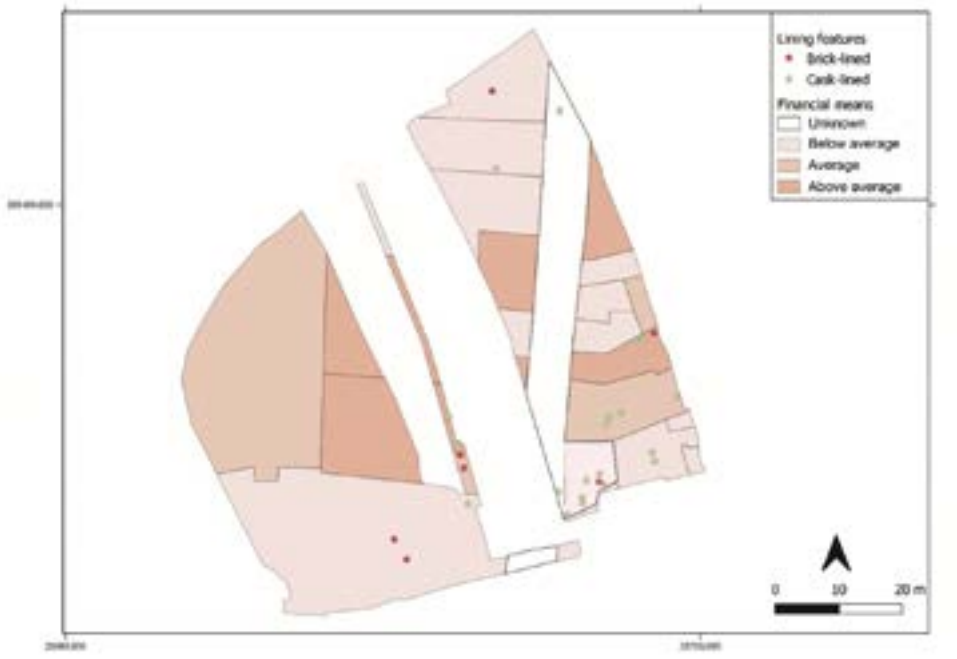

Figure 6.10: Distribution of brick and cask lining of cesspits and water wells in the northern part of the Groote Markt excavation in Vlissingen, mapped onto the parcels in which they were found.

The spatial distribution of cask lining versus brick lining in the period 1575–1625 across different areas of Groote Markt shows that cesspits and water wells were installed on 25 out of 49 plots. The only partial coverage may be explained by the fact that cesspits and water wells were often shared by the inhabitants of multiple plots. Many of these features have also been found along plot boundaries. In addition, not all plots were fully excavated, which means that some of these features were not documented.

The analysis further reveals a clear correlation between lower financial means and a preference for cask lining. Of the features found on parcels belonging to residents with below-average financial means, 90% (17 out of 19) had cask linings, whereas this was the case for only 50% (5 out of 10) of the parcels owned by individuals with above-average financial means (see Table 6.7). This suggests that economic considerations played a significant role for residents in deciding whether to use brick or casks as lining in their cesspit or water well.

Table 6.7: Number of cask and brick features, 1575–1625, uncovered at the Groote Markt in Vlissingen, by financial means of the parcel owners.

Financial means of parcel owners	Cask	Brick	Combined	Total
Below average	17	2	0	19
Average	9	7	1	17
Above average	5	5	0	10
Unknown	2	1	0	3
Total	**33**	**15**	**1**	**49**

Though the cost of constructing cesspits or wells with brick lining was higher than using casks, the brick versions were probably more durable. For each of the 49 features, an estimated lifespan was calculated based on contextual dating, primarily derived from the finds recovered within the features. This analysis revealed an average lifespan of 180 years for cesspits and wells with brick lining, compared to an average of 91 years for cask-lined ones. Brick lining lasted about twice as long as a cask lining.

6.3.4 Availability of construction material

The availability of repurposed casks that had fulfilled their original function as containers probably contributed to the development of cask-lined shafts. In urban settings, discarded casks were readily available and therefore relatively inexpensive, and so were probably favoured for practical reasons.[264] This led to a prevalence of cask-lined cesspits and water wells rather than the more costly and labor-intensive brick lining.

264 Van Oosten, 2015, 72.

In this section, the existence of coopers' guilds is initially examined and used as an indicator of the availability of discarded casks that could be repurposed (Table 6.8). In cities where coopers' guilds existed, there would have been sufficient demand to sustain a cooperage, and this implies that these cities were involved in considerable trade in goods transported in casks. Examples of this include the herring trade in Vlissingen and the beer trade in Haarlem.[265] In addition to producing new casks, cooperages associated with the guilds would also have repaired casks. Once a cask could no longer be repaired, it would have been discarded, but with the possibility of being repurposed.

Table 6.8: Founding year of coopers' guilds in the cities included in the dataset of Van Oosten's dissertation.

City	Founding year of the coopers' guild
Vlissingen	1499
Haarlem	1443
Leiden	1549
Alkmaar	1584
Dordrecht	1437
's-Hertogenbosch	No urban coopers' guild
Deventer	1585
Amersfoort	No urban coopers' guild

The existence of a coopers' guild does not directly indicate the actual number of casks circulating in a city. The scale and nature of production associated with these guilds could vary considerably from one urban centre to another. One indicator of the extent of this variation is the number of coopers registered with each guild. In 1688, for instance, the coopers' guild in Amsterdam had 362 registered members, while the guild in Veere had only nine members in 1660 (Table 4.3). Such a range suggests significant differences in the scale of coopering activities, both production and repair. Consequently, the local availability of used casks suitable for repurposing would also have varied markedly between cities that had coopers' guilds.

Furthermore, the establishment of a coopers' guild should not be viewed in isolation from broader developments in trade networks or patterns of urban expansion. These socioeconomic shifts were often accompanied by demands for increased infrastructure, including a rise in the number of cesspits and water wells. In addition, in order to assess the prevalence of features with cask lining, the relative availability of alternative building materials must be considered as that might have influenced construction choices. For example, in Deventer roof tiles

265 Yntema, 1992; Brusse & Mijnhardt, 2012, 72.

were commonly repurposed for cesspit lining.[266] In Leiden, the presence of large-scale local brick production probably facilitated the use of bricks.[267]

To assess the impact of the local availability of casks, while considering the presence of coopers' guilds as a factor, only cesspits in Vlissingen are examined. The cesspits have been arranged chronologically in 50-year periods and categorized according to lining type, casks or bricks (Table 6.9). As previously noted, the data reveals a strong preference for cask lining, a trend that accelerated significantly after 1500. A comparison of this preference with the founding date of the coopers' guild, 1499, shows that the use of casks began very soon after the guild was founded.

Table 6.9: Type of cesspit lining by construction date in Vlissingen.

Context dates	Brick (N)	Cask (N)	Total
1300–1349	1	0	1
1350–1399	0	0	0
1400–1449	0	5	5
1450–1499	1	5	6
1500–1549	4	26	30
1550–1599	0	25	25
1600–1649	5	25	30
1650–1699	0	0	0
1700–1749	1	1	2
1750–1799	1	1	2
1800–1849	2	3	5
1850–1900	1	0	1
No context date	0	11	11
Total	**16**	**102**	**118**

To assess more carefully whether there is a correlation between the establishment of a coopers' guild in Vlissingen and the frequent occurrence of cask-lined cesspits, data from other cities can usefully be compared. For this purpose, the dataset compiled in Van Oosten's dissertation, which represents cesspit research up to the year 2013, has been used.[268] Only cesspits with a reliable start date and dated between 1300 and 1900 were selected. In addition, the analysis was limited to circular cesspits with brick, roof tile, or cask lining, which excludes refuse pits and cesspit cellars. The cities included in the analysis are Dordrecht, Haarlem, Leiden, Alkmaar, 'sHertogenbosch, Deventer, and Amersfoort (Table 6.10).

266 Van Oosten, 2015, 72.

267 Hollestelle, 1961.

268 Van Oosten, 2015.

Table 6.10: Number of cesspits by construction date in Dordrecht, Haarlem, Leiden, Alkmaar, 's-Hertogenbosch, Deventer, and Amersfoort.

	Dordrecht			Haarlem			Leiden			Alkmaar			's-Hertogen-bosch			Deventer			Amersfoort		
con-text dat es	Briick- lined	Cask- lined	Total	Brick- lined	Cask- lined	Total	Brick- lined	Cask- lined	Total	Brick- lined	Cask- lined	Total	Brick- lined	Cask- lined	Total	Brick- lined	Cask- lined	Total	Brick- lined	Cask- lined	Total
1300-1349	6	10	16	4	3	7	0	0	0	0	0	0	0	5	5	3	0	3	0	0	0
1350-1399	11	12	23	7	2	9	10	2	12	6	0	6	4	2	6	2	1	3	0	0	0
1400-1449	9	3	12	24	2	26	29	1	30	17	0	17	3	1	4	10	0	10	2	0	2
1450-1499	3	3	6	9	0	9	20	0	20	8	0	8	9	2	11	2	0	2	0	0	0
1500-1549	9	6	15	18	0	18	10	0	10	5	0	5	30	1	31	9	0	9	3	0	3
1550-1599	16	3	19	21	0	21	12	2	14	35	0	35	0	0	0	3	0	3	0	0	0
1600-1649	7	3	10	82	1	83	7	1	8	42	2	44	16	1	17	1	0	1	2	3	5
1650-1699	3	1	4	24	0	24	1	0	1	9	1	10	5	0	5	5	0	5	0	0	0
1700-1749	3	4	7	24	2	26	1	0	1	5	0	5	10	1	11	8	0	8	2	1	3
1750-1799	2	0	2	1	0	1	0	0	0	5	0	5	1	0	1	2	1	3	0	0	0
1800-1849	2	0	2	4	0	4	1	0	1	1	0	1	6	1	7	3	0	3	0	0	0
1850-1900	0	2	2	2	0	2	0	0	0	1	0	1	6	0	6	5	0	5	4	0	4
Total	**71**	**47**	**118**	**220**	**10**	**230**	**91**	**6**	**97**	**134**	**3**	**137**	**90**	**14**	**104**	**53**	**2**	**55**	**13**	**4**	**17**

Note: Green fields indicate the time period during which a coopers' guild was established in the city in question.

This overview shows no correlation between the establishment of a coopers' guild and an increase in the proportion of cask-lined cesspits. In Dordrecht, for example, where both the absolute and relative number of cask-lined cesspits is highest compared to brick-lined cesspits, at least 22 out of the 47 documented cask-lined cesspits were constructed prior to the founding of the coopers' guild in 1437 (Table 6.10).

Another notable observation is that there is a limited number of cask-lined cesspits found in the cities of Haarlem, Leiden, Alkmaar, 'sHertogenbosch, Deventer, and Amersfoort. Combined, these cities account for only 39 cask-lined cesspits out of a total of 640, a mere 6%. In contrast, Dordrecht, like Vlissingen, exhibits a

relatively high number of cask-lined cesspits. The comparison between Dordrecht and Vlissingen is particularly relevant given that both cities have unstable soil conditions (Section 6.3.2).

Another factor shared by Vlissingen and Dordrecht may be the availability of discarded casks, which, however, need not be directly associated with a coopers' guild. Both cities functioned as trans-shipment ports in the Late Middle Ages and Early Modern period.[269] The availability of casks in these cities likely relates less to local cask production than to casks having outlived their use as transport containers. In trans-shipment ports, casks were not only transferred from ship to ship. For some products, for example, beer and wine, the contents were also poured into different casks before being traded further.[270] This undoubtedly led to many casks becoming obsolete as transport containers.

To test the hypothesis that the availability of casks and their subsequent repurposing as lining is related to the presence of a trans-shipment port, a focused analysis was conducted on cesspits and water wells in Vlissingen. The city is historically known for its herring trade, and the dimensions of herring casks are known (Chapter 5). By comparing the dimensions of herring casks with the sizes of casks used as lining, it should be possible to determine whether only herring casks or other cask types were repurposed. Evidence of a wide variety of cask sizes, and therefore a diverse range of goods, would suggest that the available casks in trans-shipment ports were used as lining.

Herring casks produced in the provinces of Holland and Zeeland in the Early Modern period onward were standardized, which remained largely consistent over time. Due to the importance of maintaining a collective reputation for both the quantity and quality of herring exports, the use of well-constructed, uniform casks was essential. As a result, broad regional agreements were established to standardize casks. The official specifications for whole herring casks required a certain minimum number of staves, typically 12 or 13, a stave thickness of at least 0.9 cm, and, most importantly, a capacity of 120 liters (Chapter 5). This standardized volume requires a cask height of 69–73 cm and a bilge diameter (the widest measurement of a cask) of 49–51 cm.

For the 106 casks used as lining for cesspits and water wells in Vlissingen, both height and bilge diameter were recorded and grouped in 5 cm ranges (Table 6.11). Based on these dimensions, only 14 casks (13%) match the standard height of herring casks, and 18 (19%) fall within the expected diameter range. This suggests that the majority were not originally used for herring but for storing other goods. This supports the interpretation that in trans-shipment ports like Vlissingen and

269 Dordrecht: Unger, 1915, 971–972; Havers, 1996; Van Herwaarden et al., 1996, 185–189; Stenvert & Van Tussenbroek, 2007, 73; Vlissingen: Brusse & Mijnhardt, 2012, 82–87.

270 Twede, 2005.

Dordrecht, casks for repurposing were primarily surplus transport containers circulating in the port, rather than locally coopered casks. Availability thus appears to correlate more strongly with a city's logistics than with its manufacturing output.

Table 6.11: Height and bilge diameter of cesspits and water wells in Vlissingen.

Cask height (cm)	N	Bilge diameter (cm)	N
55–59	1	40–44	3
60–64	2	45–49	4
65–69	4	50–54	14
70–74	10	55–59	13
75–79	11	60–64	29
80–84	18	65–69	12
85–89	17	70–74	22
90–94	19	75–79	4
95–99	2	80–85	2
100–104	9	86–89	1
105–109	1	90–94	2
110–114	2		
115–119	3		
120–124	5		
125–129	0		
130–134	1		
135–139	1		
Total	**106**	**Total**	**106**

Note: The dimensions of standardized herring casks are marked in red.

Conclusion

Casks retained residual value and were frequently repurposed for a variety of uses once they had served their primary purpose as containers for traded goods. Repurposed casks served domestic purposes such as being used for furniture or were dismantled into individual staves to be used as building material or firewood. Among the many ways of repurposing casks, one in particular stands out in the archaeological record, the use of casks as lining for cesspits and water wells.

Those who commissioned the construction of cesspits or wells could choose repurposed casks as lining or the more permanent brick. This choice may have been influenced by at least three factors, soil conditions, economic considerations, and the availability of material. While such factors have been proposed as hypotheses in previous archaeological studies, the extent to which they played a role, and how they intersected with one another has not previously been examined in a focused and systematic manner. In this chapter that gap has been addressed. The question is what factors determined the choice of brick or repurposed cask as lining in the construction of cesspits and water wells in urban Vlissingen during the Late Middle Ages and Early Modern period.

The study of this chapter is based on a dataset comprising 226 features, 118 cesspits and 108 water wells, each with either a brick or cask lining. These features were uncovered in three large-scale archaeological excavations carried out in the city of Vlissingen—Groote Markt, Spuistraat, and Dokkershaven. The excavations yielded a relatively large number of well-preserved and thoroughly documented features, with construction dates ranging from 1300 to 1900. As a major trading port with a thriving herring industry, an active coopers' guild, and a central role in the distribution of goods to Antwerp, Vlissingen had abundant access to casks. This archaeological and historical data makes Vlissingen a suitable case study for investigating factors that shaped the choice of brick or repurposed casks.

The first striking pattern observed in the dataset is the high proportion of cask-lined features in Vlissingen; 86% of cesspits and 55% of water wells were constructed using repurposed casks. These proportions are significantly higher than those of inland cities such as Amersfoort, 's-Hertogenbosch, and Deventer, where features with cask lining rarely exceed 15%. Only in Dordrecht has a similarly high proportion of cask-lined features been identified, making it one of the few urban contexts comparable to Vlissingen (Table 6.10).

The high occurrence of features with cask lining in Vlissingen and Dordrecht is best explained by the availability of discarded casks. Both cities functioned as trans-shipment ports where goods such as beer and wine were not only transferred from one ship to another, but often decanted into new casks, rendering the old casks redundant (Section 6.3.4). This would have resulted in a surplus of casks

that could be repurposed. A trans-shipment port could be expected to handle a diversity of cask types of various origin, function, and size. The archaeological records of Vlissingen cesspits and wells show that the repurposed casks used in the construction of these features were of a wide variety of sizes, corresponding to what could be expected in a trans-shipment port city (Table 6.11).

The hypothesis that local cask production influenced the number of cask-lined features is not supported by the data. No clear correlation was found between the establishment of coopers' guilds, as a proxy for organized cask production, and the frequency of cask repurposing in urban construction. This supports the idea that the availability of discarded casks through commercial circulation was decisive rather than local production.

The second key factor was the financial means of the property owner. The construction of cesspits and water wells required a significant investment, and affordability likely influenced choices of what material to use. Previous research in Dordrecht determined that cask-lined cesspits appeared more frequently in the city's poorer neighborhoods. This pattern is further supported by the will of Bommenee (Table 6.5), which shows clearly that using cask lining for a water well was considerably cheaper than brick lining. The analysis of the Vlissingen dataset confirms this trend, revealing a clear correlation between the use of cask lining and parcels owned by individuals with below-average financial means (Table 6.7).

A third factor that may have influenced the choice between cask lining and brick lining is local soil conditions. To investigate this, the distribution of cask-lined features was analyzed across various locations in Vlissingen's historic city centre, characterized by their unique subsoil properties. However, no clear correlation was found between unstable soil or soil with a low load-bearing capacity and a higher occurrence of features with cask lining (Figure 6.8). This suggests that subsoil variation in Vlissingen did not play a significant role in determining the construction materials used for cesspits and water wells.

This research shows that the use of casks in cesspits and wells in Vlissingen was mainly driven by availability of material and economic factors. As a trans-shipment port, Vlissingen had a surplus of discarded casks, making them a cheap and readily available alternative to brick. This preference was especially common among lower-income property owners. In contrast, local soil conditions had little influence on construction choices. Together, these findings bring to light how the repurposing of material in urban infrastructure was driven not only by practical constraints but also by broader economic and logistical dynamics characteristic of port cities like Vlissingen.