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

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1. Introduction



1 Introduction

1.1 General introduction

Casks are a common find within Dutch archaeological contexts, hardly a month passes without a cask being unearthed somewhere in the Netherlands. These casks are most frequently encountered in urban archaeological contexts, where they were often repurposed as the lining of cesspits or water wells (Figure 1.1 left). In addition to their terrestrial occurrences, casks are also regularly encountered within the maritime landscape (Figure 1.1 right). On nearly all shipwrecks where cargo has been preserved, casks are among the most ubiquitous artifacts, originally used for the storage and transport of various merchandise. Yet, despite their frequent occurrence and broad functional spectrum, casks have attracted surprisingly little scholarly attention. This lack of focused study can largely be attributed to an underestimation of their interpretive potential, resulting from a general lack of background knowledge about casks.

First of all, this issue becomes most apparent in the way casks from urban contexts are studied and interpreted. Excavations at the Groote Markt in Vlissingen, for instance, yielded a total of eighty-five barrel wells, many of which were constructed from multiple repurposed casks. The contents of these features were analyzed meticulously, but the casks have only received minimal attention. Based on the recovered ceramics and metal artifacts, an assessment was made of the users' socio-economic status. In addition, the study of animal bone material and macro-remains (such as seeds and pits) contributed to the reconstruction of their dietary practices. The casks themselves, however, were examined only at a very basic level. None of the recovered casks were subjected to such a detailed analysis that the commodities they once contained could be identified, despite the fact that such information could have provided valuable insights into their users' consumption patterns and the broader networks in which they participated.

Furthermore, cask marks were observed on 55 casks recovered from the urban archaeological excavation in Vlissingen. Although these marks were described, they could not be further interpreted in a way that would provide greater insight into the purpose of their application, their production context, or their possible association with specific goods or commercial systems. Consequently, the absence of a detailed analysis of the cask marks has prevented a deeper understanding of the casks' lifecycle, leaving aspects of their production, use as transport containers, and broader role within systems of distribution and consumption underexplored.



Figure 1.1: Left: A fifteenth-century water well constructed from four repurposed casks from Raversijde (Belgium), illustrating how archaeologists typically encounter casks in an urban archaeological context (M., Pieters & et al. (2013). Right: a cask in maritime archaeological context, on the 19th century Bermuda Shipwreck (United States, https://www.reddit.com/r/submechanophobia/comments/14uzuku/bermuda_shipwreck_lake_superior/, last accessed on 28-10-2025).

Secondly, maritime archaeologists constitute another key group investigating casks, as these are among the most common finds in shipwreck contexts. Ships from the Late Medieval and Early Modern periods routinely carried casks, which are often found on wrecks when preservation conditions are favourable. Such preservation is typically ensured when casks or their parts become trapped within the ship's structure, preventing them from being washed away.

This was the case with the shipwreck *Burgzand Noord 4*, located in the roadstead of Texel, where a total of 887 cask components were recovered, representing at least 47 individual casks, of which some still contained coffee beans.² A similar situation was observed at *Scheurrak S01* (late 16th century), also found in the Texel roadstead, where numerous cask remains were discovered.³ In total, approximately 800 cask fragments were recorded, prompting archaeologists involved in the excavation to describe these find as "an orgy of staves".⁴ Unlike those from *Burgzand Noord 4*, the casks from *Scheurrak S01* had disintegrated into separate staves and headboards.

In the subsequent analysis of the cask assemblages from both shipwrecks, efforts were made to reconstruct the cargo through the study of the casks and to identify

² Overmeer, 2004, 1; Vos 2012, 183-184.

³ Burger, 2025, 174.

⁴ Maarleveld, 1993, 215.

the parties involved in the associated trade by examining the cask marks. However, these analyses had not yielded results that allow the archaeological evidence to be linked to written sources, connections that could potentially have contributed to the identification of the shipwrecks themselves.

Archaeological timber specialists and dendrochronologists constitute a third group of researchers who work to enhance the interpretation of casks, which are recovered from both urban and maritime archaeological contexts. The study of timber from Dutch archaeological contexts holds a special position due to the exceptional preservation conditions for organic material in the typically oxygen-poor Dutch soil. These conditions allow well-preserved staves from urban features such as cesspits or water wells to be precisely dated through dendrochronological analysis.

In dendrochronological research, staves from maritime archaeological contexts are often used to approximate the date of a shipwreck's sinking. The assumption is that dating the cargo provides a timeframe closer to the ship's final voyage than dating the ship's construction timbers, which were felled prior to the ship's building. Consequently, a dendrochronological date from a stave belonging to a cask carried on the ship's last journey can offer a more accurate indication of the wreck's date.

Accurate interpretation of dendrochronological dates from staves in both urban and maritime contexts requires a clear understanding of cask production. Key factors include the provenance of the timber, its processing location, and the range of timber ages within individual casks. Equally important are fundamental aspects of their use after production, such as the typical lifespan of casks as transport containers, which have yet to be thoroughly investigated. Understanding these factors is essential for situating dendrochronological dates within a framework that can, for example, provide a more reliable estimate of a shipwreck's date. In interpreting dendrochronological dates from staves in urban archaeological contexts, it is also necessary to gain insight into how casks were repurposed and the duration of their use in this secondary phase.

Across these examples, the untapped research potential of casks, whether studied by maritime or urban archaeologists, dendrochronologists, or other specialists in archaeological timber, can be traced to a common cause. The lack of comprehensive research on casks from archaeological contexts has resulted in insufficient knowledge of their entire lifecycle, leaving aspects such as the casks production, use as transport containers, repurposing, and cask marks underexplored. By situating casks within their production, use, and repurpose contexts, this study aims to provide a comprehensive framework for understanding their archaeological significance and to enhance the interpretive potential of cask-derived data across both urban and maritime contexts.

The study employs a multidisciplinary methodology, drawing on a diverse range of sources. These include archaeological data from both urban and maritime contexts,

some of which were additionally examined through dendrochronological analysis, 3D scanning, and photometric stereo techniques. Complementary sources include historical written records, iconographic representations, and interviews conducted with present-day coopers. By integrating these approaches, this research provides a comprehensive understanding of casks as widely used and functionally versatile material culture in the Late Middle Ages and Early Modern period.

1.2 Casks as part of the maritime and urban landscape

The frequent occurrence of casks in archaeological contexts can be explained by their status as ubiquitous elements of the Dutch urban and maritime landscape during the Late Middle Ages and the Early Modern period. Casks were prominently present on quaysides, in warehouses, and aboard ships, underscoring their integral role in transport and trade logistics. However, the presence of casks was by no means confined to port areas. In marketplaces and trade fairs across Europe, goods were commonly displayed and sold in casks. In this way, casks were directly associated with commerce, not only as a container, but as a functional container in the sale of goods. Within these interconnected urban and maritime landscapes, casks fulfilled a variety of functions, forming part of a continuous sequence of use across both maritime and urban settings.

Cask in the maritime landscape

Most visibly, casks played a central role in maritime contexts, serving as essential transport containers for a wide range of merchandise from the Late Medieval period onwards. Nonetheless, the use of casks predates this period, with examples recovered from Dutch archaeological contexts as far back as the Roman period.⁵ Their numbers, however, increase significantly from the Late Middle Ages, marking the large-scale adoption of the cask as a transport container in maritime contexts, a practice that continued well into the twentieth century.

The cylindrical shape and relatively uniform dimensions of casks facilitated efficient handling, allowing casks to be loaded and unloaded with ease across various modes of transport, including seagoing ships, river barges, and horse-drawn wagons (Figure 1.2_1,3). The widespread adoption of casks as transport containers from the Late Middle Ages onwards also led to a growing standardization of container forms. This offered a distinct advantage over loose cargo carried in ships' holds or other forms of packaging, such as sacks and bales, which typically varied greatly in size and thus complicated efficient loading and unloading.

In several key respects, the large-scale adoption of casks from the Late Middle Ages onwards can be compared to the introduction of the shipping container in the

⁵ Marlière, 2001; Lange et al., 2017, 115.

mid-twentieth century⁶, a parallel that allows modern readers to better appreciate the significance of casks within the maritime landscape. Both developments transformed the handling of goods by increasing the efficiency of loading, transport, and unloading processes.⁷ These advances not only transformed patterns of trade and the organization of labour but also had a lasting impact on the physical infrastructure of maritime transport. The design of ships evolved to accommodate larger and more efficiently arranged cargoes, while ports were expanded and restructured to facilitate these new modes of transport, handling, and storage. Together, these developments mark pivotal moments in the long history of logistical innovation in seaborne trade.

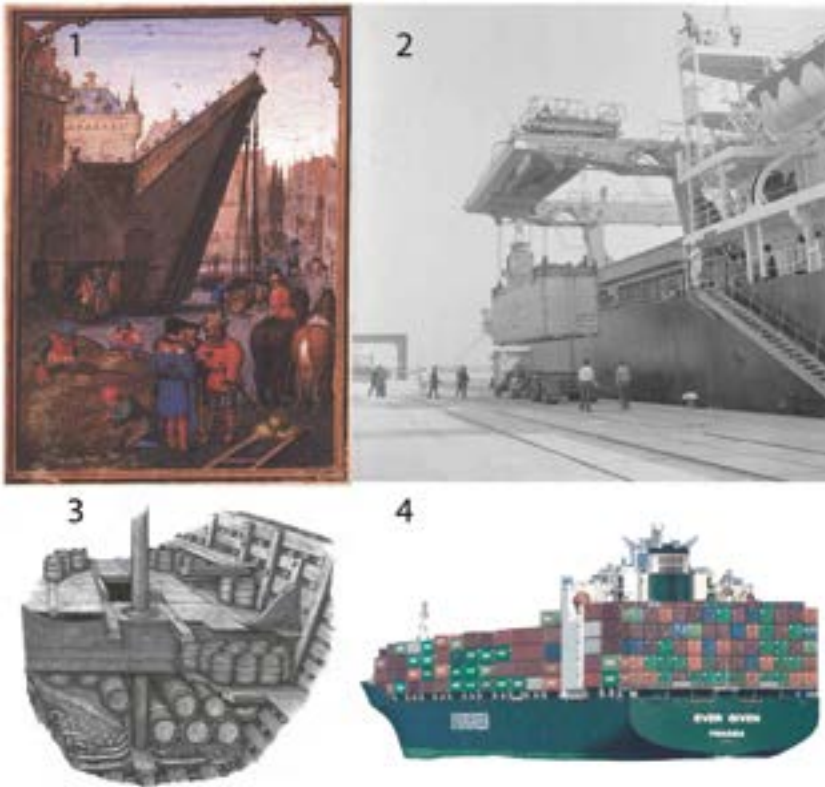


Figure 1.2: 1: The port of Bruges in 1525; 2: The MS Fairland, the first container ship to arrive in the port of Rotterdam in 1966. 3: Sketch of the reconstructed Kamper cog with main deck and "between" decks; 4: The container ship Ever Given. Sources: 1. *Labors of the Months: October* [Oil on canvas, Cod. Lat. 23628, fol. 11v.], by Simon Bening, 1525. Bayerische Staatsbibliothek, Munich, Germany; 2. Jan Voets, "Speciaal voor container-vervoer ontworpen schip Fairland in Rotterdam," March 3, 1966 (Den Haag, Nationaal Archief, toegangsnummer 2.24.01.03). Foto: Nationaal Archief, Den Haag. <http://hdl.handle.net/10648/aae8bdf6-d0b4-102d-bcf8-003048976d84>; 3. Vlierman, 2021, 647; 4. Robert Schwemmer, "Ever Given", March 14 2015, <https://www.noaa.gov/topic-tags/hydrography?page=2>, Gelicenseerd via: <https://creativecommons.org/licenses/by-sa/2.0/deed.en>, CC BY-SA 2.0.

⁶ Oosterbaan, 2024.

⁷ Levinson, 2016.

Ships

The first comparable effect between the large-scale adoption of the cask as a transport container and the introduction of the modern shipping container was the substantial increase in the carrying capacity of ships.⁸ The first container ship to dock at the Port of Rotterdam carried only 226 containers in 1966⁹ (Figure 1.2_2), whereas one of the world's largest presently used container ships, such as the *Ever Given*, can accommodate more than 20,124 containers (Figure 1.2_4), an almost ninetyfold increase achieved in less than sixty years. A comparable development occurred during the Late Middle Ages, when ships also began to grow significantly in size. Prior to the Late Middle Ages, ships built according to the northern shipbuilding tradition (c. 700–1250) had a cargo capacity of approximately 50 tons.¹⁰ By the Late Middle Ages, this had increased to approximately 160 tons with the introduction of the cog (*kogge*, Figure 1.2_3), and by the Early Modern period to around 1,000 tons with the carrack (*kraak*)¹¹, representing a twentyfold increase in cargo capacity of ships compared to the period before the Late Middle Ages.

Ports (cranes)

The introduction of the modern shipping container not only led to the construction of larger ships designed specifically for container transport, but also required major adaptations to port infrastructure. Ports where these new container ships docked had to be deepened and expanded to accommodate their size and draft. This transformation had a profound impact on both the spatial layout and the scale of modern harbors. The Port of Rotterdam, for instance, has tripled in surface area since 1960, largely due to the construction of new port complexes such as the Europoort and the Maasvlakte, which were developed to accommodate container shipping.¹²

Not only did the size of ports change, but their facilities also evolved in line with the emerging container transport system. The installation of container cranes enabled standardized containers to be efficiently transferred between ships, trains, and trucks, greatly streamlining the processes of loading and unloading (Figure 1.2_2).¹³

The large-scale adoption of casks from the Late Middle Ages had a comparable impact on the development of the transport system, particularly visible in port infrastructure. Across the Low Countries and other regions, many ports were newly constructed or expanded to accommodate the new types of ships, which had

⁸ Levinson, 2016.

⁹ Port of Rotterdam, n.d. History of the harbor. Available online at:

<https://www.portofrotterdam.com/nl/online-beleven/geschiedenis-van-de-haven>. Last accessed on 01 May 2025.

¹⁰ Asaert et al., 1976.

¹¹ Asaert et al., 1976.

¹² Peek & Stam, 2016.

¹³ Levinson, 2016.

increased in size and had a greater draft than older ships. The merchant ships that arrived in these ports were increasingly loaded with goods packed in casks. Many of these casks could be manually loaded and unloaded, as seen in an illustration from a 1502 manuscript of the Swedish porters' guild. The image shows two individuals carrying a cask using a carrying beam with supporting stands (Figure 1.3_left). This method of moving casks was only possible with casks that weighed no more than 150 kilograms when fully loaded. This was the case, for example, with herring casks from Zeeland and Holland at the end of the 15th century, which had a prescribed capacity of 120 liters and weighed approximately 150 kilograms.¹⁴



Figure 1.3: Left: Two individuals transporting a cask using a carrying beam and supports (The image is taken from the PORTERS' GUILD BOOK from Stockholm. *Dragare i Skraan* [Manuscript, Invnr. B594], Unknown author, 1502-1503. Photo: Kungliga biblioteket, Stockholm, Sweden); Right: *The Port of Riga*. (Riga [Oil on canvas], Unknown author, second half of 17th century. Museum of the History of Riga and Navigation, Riga, Latvia).

For heavier cargo, manual labour alone was no longer sufficient. This applied, for example, to wine oxhead casks with a capacity of around 230 liters, which, when filled weighed approximately just under 300 kilograms.¹⁵ To handle such loads, ports were adapted through the installation of cranes (Figure 1.3_right). That these cranes were primarily used for shipping casks is evident from iconographic sources. A 1525 painting of the Bruges port, for example, shows the various steps involved in transporting wine casks (Figure 1.2_1). In addition to depicting the unloading of wine casks with the use of a crane, the sale of the wine is also featured. To further transport the wine cask that is being sold, two draft horses with a sledge are standing ready. Archival sources from Dutch urban authorities further confirm the use of port cranes for loading and unloading relatively heavy cargo. That this

¹⁴ Oosterbaan, 2023.

¹⁵ Database *De oude Nederlandse maten en gewichten*, n.d., <https://mgw.meertens.knaw.nl/plaats/44>.

heavy cargo was primarily wine casks is evident from the leasing of the port cranes to wine merchant guilds, as recorded in the Raads Dagelijks Boek (Council Daily Book) of the city of Utrecht in 1532¹⁶, and in the (City Book) of the city of Leiden (1391), a “wine crane” is referenced.¹⁷

Preservation

One key characteristic of casks, in which casks differ from the modern shipping container, is their preservative function. While this aspect may not align with the analogy of the contemporary shipping container, it played a critical role in the development of late medieval trade markets. The use of casks in extending the shelf life of perishable goods enabled them to be stored for longer periods and, therefore, they could be transported greater distances. This, in turn, facilitated regional specialization and interregional trade in regional goods.

Preservation of perishable goods was vital in pre-industrial societies, and from the Late Middle Ages onward a variety of methods were employed to reduce spoilage caused by microbial activity or environmental factors. Food preservation works by slowing down spoilage caused by mold, bacteria, or chemical and physical processes. In the Late Middle Ages, a variety of preservation techniques were employed that can be broadly categorized as cooling, drying, the addition of substances for preservation, and sealing from sunlight and open air (Figure 1.4).¹⁸ Different types of food were preserved using one or more of these techniques. Fish, for example, could be dried, smoked, or salted resulting in products such as dried stockfish or salted and gutted herring. For fruits, drying and the addition of sugar were the most common methods of preserving. Regardless of the specific preservation technique, limiting exposure to air was essential for all perishable goods. The cask as a sealed container met this requirement effectively and thus played an essential part in prolonging the usability of various foodstuffs.

	Adding substances						
	Drying	Smoking	Brining	Pickling	Sugar curing	Alcohol curing	Sealing
Fish							
Meat							
Fruit							
Vegetables							
Dairy products							

Figure 1.4: Overview of the preservation techniques used in the Late Middle Ages and Early Modern period (light green = rarely used, green = used in moderation, dark green = frequently used).

¹⁶ Smit, 2002, 19.

¹⁷ Barendrecht & De Boer, 1981, 118.

¹⁸ Jobse-van Putten, 1989.

Specialization of trade markets

The introduction of the modern shipping container led to a dramatic reduction in transport costs, making it economically viable to separate different phases of production, as well as final consumption, across vast geographical distances. This innovation transformed global trade, enabling Asia to emerge as the world's manufacturing hub and made an unprecedented variety of goods from around the globe accessible to the average consumer. As historian Marc Levinson observed in his study *The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger*, the container quite literally shrank the world while expanding the scale of the global economy.¹⁹

The significance of the shipping container has also been recognized within the Netherlands. In 2014, *Koninklijke Hollandsche Maatschappij der Wetenschappen* and the *NCR Handelsblad* held an essay competition posing the question: "What is the most important invention of the past 100 years and why?"²⁰ Bart Kuipers, Senior Researcher in Port Economics at Erasmus University Rotterdam, won the first prize with his essay, in which he argues that the introduction of the shipping container is the most consequential invention of the last century. Kuipers compared the introduction of the shipping container to the invention of the wheel, emphasizing that modern society is now unimaginable without it.²¹

Like the modern shipping container, the cask played a crucial role in the specialization and expansion of trade markets across Europe during the Late Middle Ages and the Early Modern period. Although the cask itself was not a new invention, its widespread adoption in long-distance trade networks marked a significant shift in the storage, preservation, and transport of goods. This allowed products to remain in transit for longer periods, enabling trade over greater distances. In other words, producers and consumers could be located far apart geographically.

In the Netherlands, from the Late Middle Ages onwards, there was an increasing focus on the production and export of a variety of goods, which allowed the Netherlands to occupy a prominent position within overlapping trade networks.²²

Among the most important of these were beer and herring. Beer production from the 15th century onwards was largely concentrated in cities such as Haarlem,

¹⁹ Levinson, 2016.

²⁰ Kuipers, B. (2014, october 10). Wat is de beste uitvinding van de laatste 100 jaar? Koninklijke Hollandsche Maatschappij der Wetenschappen. <https://khmw.nl/nieuwsarchief-160/>.

²¹ Kuipers, B. (2016, may 10). Revolutie van de laadkist. Erasmus University Rotterdam. <https://www.eur.nl/nieuws/revolutie-van-de-laadkist>.

²² Yntema, 1992.

Gouda, and Delft, which exported much of their beer in casks.²³ The beer industry generated substantial demand for casks; in 1543-1545, approximately 950,000 beer casks were used in the nine major beer producing cities in Holland.²⁴

To an even greater extent, the herring industry in the Netherlands was focused on export. By the Late Middle Ages, herring had become a staple commodity for export, with the cities located in Zeeland and Holland emerging as hubs for this thriving trade market.²⁵ The herring fishery also generated a significant demand for casks. Rotterdam, Brielle, Delfshaven, and Maassluis, located in the Meuse estuary, and Enkhuizen, in northern Holland, together brought in an annual catch veraging around 25,000 lasts at the peak of the herring industry in the first half of the 17th century.²⁶ Given that each last required 12 to 14 casks, approximately 350,000 casks were needed every year. In addition to the suitability of casks for storing large quantities of herring, their tight seal, combined with the brining process, significantly extended the herrings' shelf life.

The development of both Dutch beer production and the herring fishery demonstrates that the large-scale use of casks as transport containers had a significant impact on the development of export trade and generated a substantial demand for casks. These casks played a critical role in the late medieval and early modern maritime landscape, complementing developments in other parts of the transport system, including ships, ports, and related infrastructure.

Naturally, these developments in the transport system could not have taken place without other large-scale changes from the Late Middle Ages that also shaped the maritime landscape. These include the rising purchasing power of the urban middle class, the establishment of safe shipping routes, the emergence of institutional frameworks, and the increasingly professional organization of commodity markets.²⁷ Although many of these factors are difficult to trace archaeologically, casks represent an exception, as they are relatively abundant in the Dutch archaeological record.

Casks in urban landscape

Even those not directly involved in maritime trade or long-distance commerce would have encountered casks regularly in daily life. Casks of specific commodities were a familiar sight on quaysides, marketplaces, and fairs in European cities, which were locations where the urban and maritime landscapes overlap.

²³ Oosterbaan, 2023, 103.

²⁴ Van Bochove, 2004, 5.

²⁵ Oosterbaan, 2023, 104.

²⁶ Epstein, 2000; North & Thomas, 1973.

²⁷ Epstein, 2000; North & Thomas, 1973.

Within the urban landscape, casks were initially highly visible, as their production was primarily an urban activity (Figure 1.5_1). The 38 cooper guilds established within the present-day borders of the Netherlands were all located in cities,²⁸ making casks a familiar and integral part of everyday life for the residents of these urban centers. Their primary users, such as breweries and the herring industry, also conducted part of their activities in urban settings, ensuring that city inhabitants remained closely acquainted with the presence of casks in the urban landscape (Figure 1.5_2).

Also after the production phase and the filling with merchandise, casks remained highly visible in the urban landscape, when being sold at marketplaces, and fairs. Even after the casks had been sold, they remained visible, appearing in inns, taverns, and other establishments that offered food and drink (Figure 1.5_3). These venues relied heavily on casks for the storage and dispensing of products such as beer, wine, herring, and other foodstuffs. For the consumer, the cask was, therefore, a familiar part of both purchase and consumption.

Beyond their initial commercial function, casks also played a role in domestic and public interiors. Casks were often repurposed as furniture, such as tables or chairs, particularly in inns and among the lower classes (Figure 1.5_4). Equally important, but less visible, casks featured in early sanitation infrastructure. Stacked casks could serve as vertical shafts for cesspits, providing a rudimentary but effective means of waste disposal (Figure 1.1_left).

In sum, a cask could function in multiple capacities: as transport containers for trade goods, as a vessel for the storage and sale of merchandise, as repurposed material for domestic furnishings, and, eventually, as an element in urban waste infrastructure. Its omnipresence in both public and private spaces firmly embeds the cask within the material culture of the urban environment between 1300 and 1800.

²⁸ Oosterbaan et al., 2022. 18.

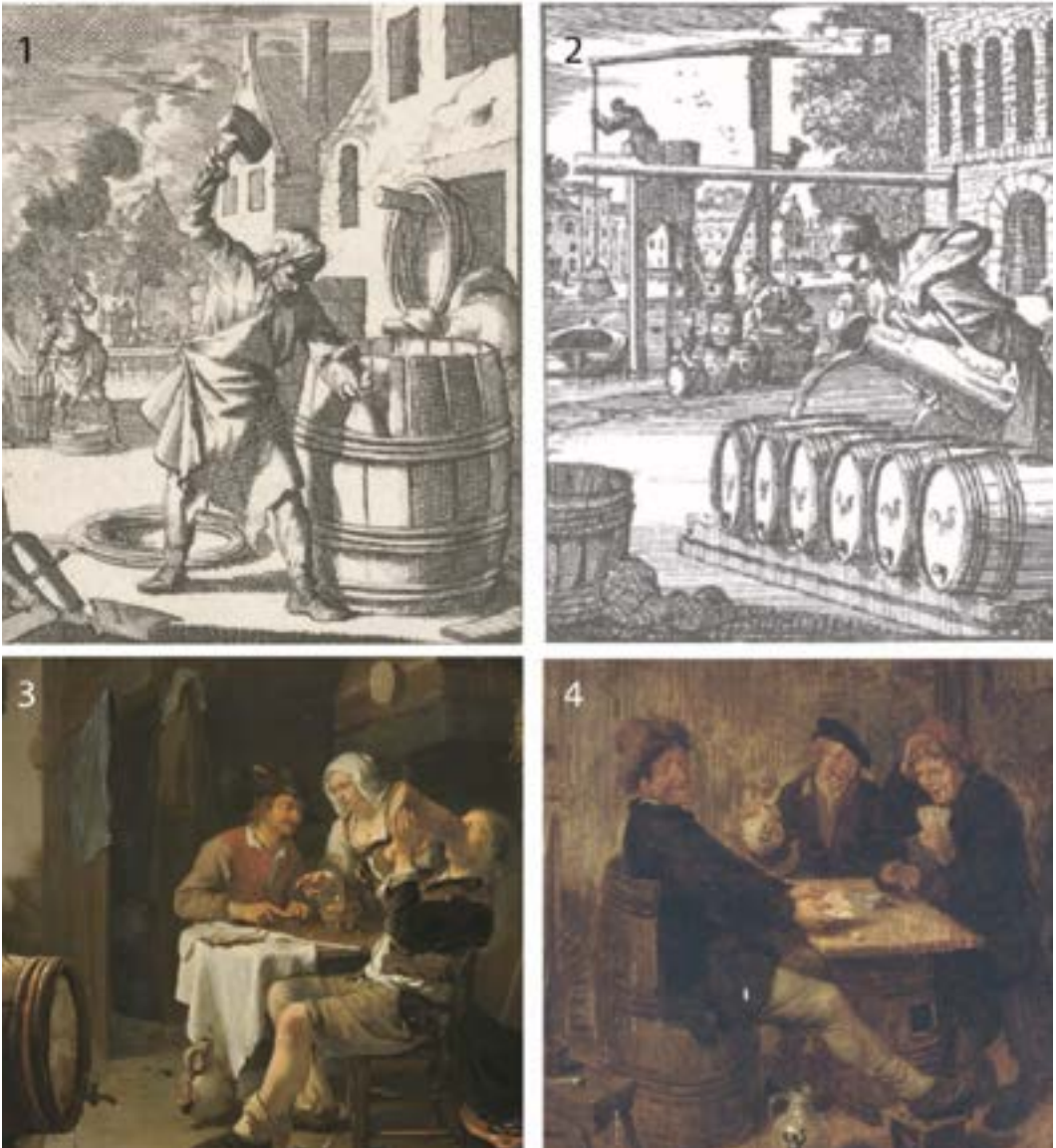


Figure 1.5: 1. Cooper hammering the hoops onto a cask; 2. Beer casks being filled at a brewery; 3. Beer cask in a tavern; 4. Cask used as a table and cask. Sources: 1. *The cooper* [Print, RP-P-OB-44.496.], by Jan Luyken, 1694. Rijksmuseum, Amsterdam, The Netherlands; 2. *The Brewer* [Etching, no. RP-P-OB-44.505], by Jan Luyken, 1694. Rijksmuseum, Amsterdam, The Netherlands; 3. *Peasants inn* [Oil on canvas, no. S 527], by Frans van Mieris (de Oude), c. 1655. Museum de Lakenhal, Leiden, The Netherlands; 4. *Peasants playing cards in an interior* [Oil on panel, private collection], by Jan Miense Molenaer, ca. 1650s. Database RKD Netherlands Institute of Art History, n.d., <https://rkd.nl/images/110347>.

1.3 Theoretical framework

This dissertation presents the first comprehensive study of casks from Dutch archaeological contexts dating between 1300 and 1800, which can be regarded as pioneering research. Prior to this study, only limited attention had been given to this relatively common category of finds within the Dutch archaeological record. An overview of previous research on casks, their scope, and the resulting limited knowledge of casks derived from these studies is provided for each sub-study in the corresponding chapters of this dissertation.

As stated, casks are frequently encountered in the archaeological record. Their frequent occurrence can be linked to the widespread production of casks, their use as transport containers, and their repeated repurposing for various functions. In addition, the excellent preservation of this organic material in the Netherlands' waterlogged soils has further contributed to their survival.

To situate the study of casks within their broader maritime and urban contexts, it is essential to begin with a detailed examination of the casks themselves, given the limited knowledge available. This involves analyzing the distinct phases of their lifecycle: production, use as transport container, and subsequent repurposing. Each phase is analyzed separately to develop a comprehensive understanding of the casks' material biography. The *chaîne opératoire* provides the most appropriate theoretical framework for this analysis, as it emphasizes the sequence of actions, choices, and transformations that shape an artifact throughout its lifecycle.

Only once insight has been gained into the lifecycle of the cask itself can the next step be taken: situating the cask within the maritime cultural landscape. This approach allows casks to be studied through the lens of maritime cultural landscape theory, placing them in a broader context and examining them not as isolated finds or assemblages, but as elements connected to people, products, institutions, and locations.

Accordingly, the research presented in this dissertation applies a layered theoretical framework. First and foremost, the study focuses on analyzing the casks' lifecycle through the lens of *chaîne opératoire* theory. Where possible, the subsequent step of situating the studied casks within the maritime landscape has been undertaken. Due to the pioneering nature of this work, this was not feasible for every sub-study, but the dissertation nonetheless aims to provide a foundation for more comprehensive analyses of casks as part of a maritime landscape in future research.

The following sections provide a brief explanation of how the *chaîne opératoire* approach is applied in this study, followed by an outline of the theoretical framework concerning the maritime landscape.

1.3.1 Chaîne opératoire framework

The study of casks from archaeological contexts yields valuable insights when analyzed through the lens of the *chaîne opératoire* theory. This theoretical framework facilitates an understanding of the sequential processes and events that define an artifacts' lifecycle, encompassing the phases from raw material procurement, through production, use, repurposing, and ultimately, disposal. The theory prioritizes material objects, situating them within the technical and social processes that characterize their lifecycle.

Initially developed in France during the first half of the previous century, the theory was predominantly applied to the study of lithic artifacts.²⁹ Over time, its scope has broadened to include the other artifacts and the context of its creation, encompassing the actions and cognitive processes involved.³⁰ *Chaîne opératoire* analysis comprises three levels:

1. All components of the construction and its technique, including materials, tools, fuels, and movements required.
2. The sequence and relationship between the factors of the artifact, such as the steps of the production process.
3. The socio-cultural context of the artifact, such as gender roles and labor division.

In the context of late medieval and early modern archaeology, casks can be utilized as a case study for the application of the *chaîne opératoire* theory. These wooden vessels represent far more than mere storage containers, as they encapsulate the technical, economic, and social dynamics of their era. Casks display a long and traceable lifecycle, reconstructable from their presence in diverse archaeological contexts evident in diverse archaeological contexts, such as both shipwrecks containing raw material for cask production and those containing casks filled with merchandise. In urban archaeological contexts, casks are encountered in their repurposed phase, providing valuable insight into the secondary uses of these containers. When the cask from these two different archaeological contexts is studied in detail, insight can be gained into the three distinct phases of its lifecycle: production, use as a transport container, and subsequent repurposing (Figure 1.6).

²⁹ Leroi-Gourhan, 1945, 1964; Mauss, 1947.

³⁰ Schiffer, 1972, 1976; Lemonnier, 1993, 2012; Soressi & Geneste, 2011; Blonk-van den Bercken et al., 2020.

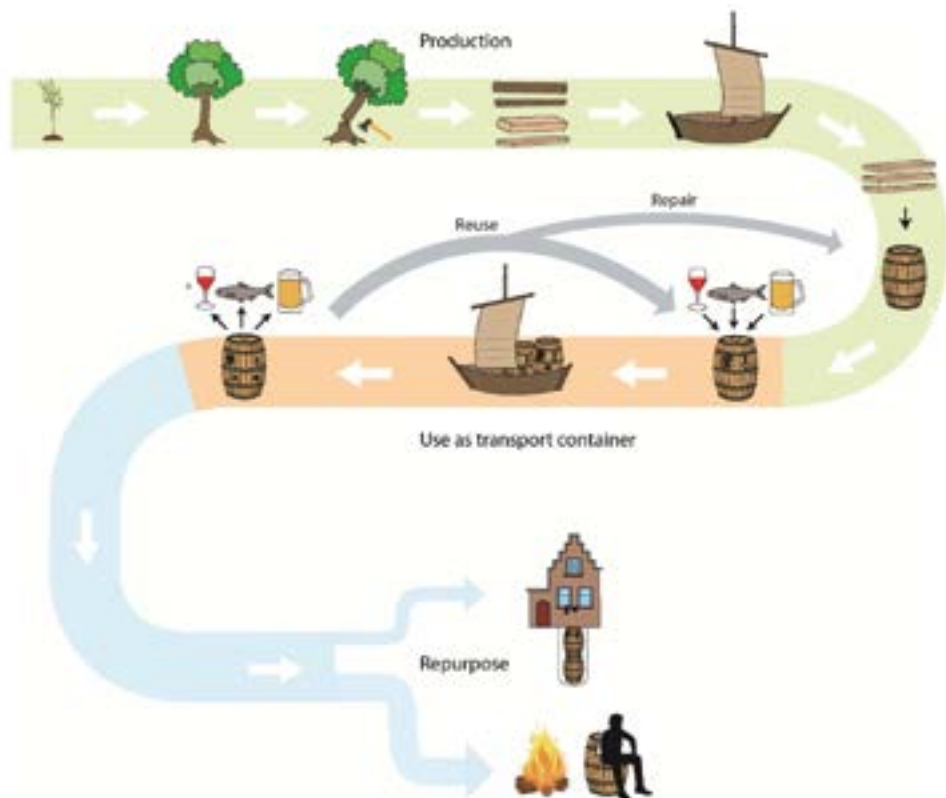


Figure 1.6: Schematic overview of the lifecycle of a cask. Production phase – green; its use as a transport container – orange; repurposing – blue.

Coopers, the artisans responsible for crafting casks, adhered to a sequence of selection criteria and technical procedures that converted raw materials into functional containers. When examined through the framework of the *chaîne opératoire* theory, the first stage of the production phase encompasses the procurement of the timber used by coopers. The selection of timber for cooperage reflects a careful consideration of the specific requirements imposed on the material, including durability, flexibility, and suitability for different types of casks. It also takes into account the various processing steps necessary to convert raw timber into semi-finished products, such as clapboards.

The next phase of production involves the actual assembly of the casks. This process reveals the cognitive and practical skills inherent in cooperage, as well as the decisions made at each stage, which were shaped by available resources, technological expertise, and market demands. A key distinction between casks and the lithic objects, for which the *chaîne opératoire* was originally developed, lies in the presence of written sources. These documents record both technical production steps and detailed specifications for casks for specific products, providing casks

recovered from archaeological contexts with additional contextual information. As a result, the study of casks allows for a comprehensive reconstruction of their production sequences, linking material evidence to documented practices and further illuminating the cognitive and decision-making processes underlying their manufacture.

Casks therefore provide a valuable case study for a more detailed application of *chaîne opératoire* theory, in which the regulatory features imposed on casks play a prominent role. They can also be used to investigate the enforcement of these regulations by examining the marks found on casks, which materialize this enforcement. In this way, casks fit well within the revision of *chaîne opératoire* theory proposed by Slaughter (2024), referred to as network *opératoire*. This framework envisions *chaînes* as interconnected nodes within a larger network, allowing for a more dynamic analysis of technological and cognitive processes. For example, the production of a cask can be examined as a network of interconnected *chaînes*: the selection of suitable timber, its processing into semi-finished components, the transport of these materials by ship, their arrival at the cooperage, the actual assembly of the cask according to prescribed dimensions and properties, and the oversight and inspection conducted by guilds or urban authorities. Each of these *chaînes* intersects with others, forming a complex network that links technical practices, regulatory norms, social roles, and economic relationships.

During their use as transport containers, casks underwent transformations as they circulated among producers, merchants, and consumers. Furthermore, casks were often reused as transport containers, potentially across different regions, encountering evolving regional market demands. This illustrates Schiffer's concept of the behavioral chain, in which material objects bear the traces of human action.³¹ Such traces are visible not only in the spatial distribution of the casks in archaeological contexts reflecting their movement through trade networks, but also in the marks applied during their use as transport containers. These inscriptions and physical modifications make the tangible changes to the casks apparent, documenting human decisions and practices throughout their lifecycle. Naturally, casks could be repaired during their use as transport containers whenever necessary to maintain their functionality. Only when the decision was made to stop repairing them did the casks enter the next phase of their lifecycle.

Additionally, the repurposing of these casks in urban environments, such as their utilization in the lining of cesspits and water wells, underscores their adaptability and secondary utility. During this phase of their lifecycle, casks frequently underwent physical modifications, such as the removal of their heads. Within the *chaîne opératoire* framework, these alterations are treated as integral steps in the artifacts' operational sequence, shedding light on its behavioral chain. It is important to recognize that repurposed casks cannot be directly tied to the

³¹ Schiffer, 1976.

consumption patterns of the original product, since empty casks were sometimes traded or relocated to locations where a cask was needed for lining a cesspit or a water well.

In sum, the approach enables the tracing of such transformations throughout the casks' lifecycle, providing deeper insight into the social practices and contexts in which these objects were embedded.

1.3.2 Maritime cultural landscape framework

Once the cask has been analyzed through the *chaîne opératoire* approach, in some cases an assemblage of casks can be analyzed within the framework of the maritime cultural landscape. Since these assemblages primarily originate from shipwrecks, this maritime-oriented concept is particularly well suited for understanding their broader social, economic, and spatial context.

The maritime cultural landscape was introduced in 1992 by the Danish archaeologist Westerdahl to provide a broader framework for interpreting archaeological remains found underwater.³² His initial research, conducted along the east coast of Sweden, revealed that underwater remains could not be studied in isolation but were intrinsically connected to the terrestrial cultural landscape and areas of maritime exploitation. Westerdahl emphasized that these underwater and coastal sites should be seen as extensions of one another, rather than separate assemblages. In Dutch terminology, this distinction can be understood as encompassing both *landbouw* as *zeebouw*, reflecting the interconnectedness of land- and sea-based human activity.

Based on these principles, Westerdahl defined the concept of the maritime cultural landscape as 'the whole network of sailing routes, with ports, havens and harbors along the coast, and its related constructions and other remains of human activity, underwater as well as terrestrial'.³³ In 2013, Westerdahl further elaborated the framework by introducing seven sub landscapes, namely economy, transport and communications, power, outer resources, inner resources, cognition, and leisure. Each of these represents a distinct component of the maritime cultural landscape and facilitates the systematic study of the archaeological record.³⁴

The introduction of the concept also stemmed from Westerdahl's criticism of the traditional division between terrestrial and underwater archaeology, as well as the tendency to study shipwrecks as isolated finds. As a result, the maritime cultural landscape framework offers a valuable approach for maritime archaeologists and

³² Westerdahl, 1992.

³³ Westerdahl, 1992, 6.

³⁴ Westerdahl, 2013, 746.

historians to investigate shipwrecks and related sites within their broader cultural and environmental contexts. This perspective also guided Burger's study of the *Scheurrak SO1* wreck, which was examined through the lens of this concept.³⁵

Similar to shipwrecks, casks constitute a vital element of the maritime cultural landscape. They can primarily be understood as transport containers for merchandise, which were integral to maritime exchange networks. Beyond their functional significance, casks also represent the most frequently encountered archaeological remains within these maritime cultural landscapes, as discussed in section 1.2. Consequently, this category of finds offers an important archaeological entry point for the research of economic activities, communication networks, and resource use of maritime cultural landscapes.

However, to employ casks as an archaeological entry point for the study of maritime cultural landscapes, a more comprehensive understanding of the casks themselves is required. For instance, it is first necessary to determine the provenance of the timber used by coopers and to gain insight into the organizational and structural frameworks within which cask production operated, before the production of casks can be situated within the maritime cultural landscape. The same applies to situating casks as transport containers, where identifying the products once contained within a cask is essential, as this information allows them to be linked to specific trade network.

Cask marks represent another crucial aspect of casks, playing a key role in situating them within a broader maritime cultural landscape. Their significance lies in their ability to bridge archaeological and historical data, as they appear both on casks recovered from archaeological contexts and in written sources. However, to efficiently exploit the extensive archival material, it is essential to understand the purpose and function of cask marks. For example, a coopers' mark is most likely to appear in the archives of a coopers' guild, whereas a personal identification marks of a merchant may be recorded in commercial documents such of trade organizations, personal communication, or *cognossementen* (bills of lading). Determining the purpose and function of cask marks from archaeological contexts therefore provides a targeted entry point into the archives that can be consulted for identification.

When a cask mark from an archaeological context can be matched with one recorded in written sources, the cask can be associated with a specific individual, institution, or system of measurement. If the mark belongs to a merchant, for example, the merchants' trade network can potentially be reconstructed from the written sources. In this way, cask marks enable a more comprehensive reconstruction of maritime cultural landscapes, linking individual artefacts or entire assemblages, such as a shipwreck, to the broader systems of trade, production, and human activity along coastal regions.

³⁵ Burger, 2025.

As outlined in the introduction to the theoretical framework, the sub-studies presented in this dissertation primarily focus on the different phases of the cask lifecycle, making *chaîne opératoire* the main analytical approach. In certain cases, however, such as the sub-study of the shipwreck BZN4 (Chapter 8), historical trade networks have also been reconstructed by matching cask marks with written sources. This method situates both the shipwreck and the individuals associated with it within a broader maritime cultural landscape based on the study of casks.

Research aims and questions

The primary aim of this study is to reconstruct the lifecycle of casks, including their production, use, and subsequent repurposing, within the socioeconomic context of the Netherlands in the Late Middle Ages and Early Modern period (1300–1800). This study centres on the lifecycle of casks, which can broadly be divided into three main phases: production, use as transport containers, and subsequent repurposing (Figure 1.6).

This study presents the results of several sub-studies, each addressing specific aspects of a cask's lifecycle. Where applicable, these are integrated into the dissertation following the chronological sequence of production, use, and repurposing. However, some of these studies cannot be directly linked to a single phase in this lifecycle. These are, therefore, presented either before or after the chronologically ordered chapters, depending on their thematic relevance.

The main research question is:

What do casks from Dutch archaeological contexts from 1300 to 1800, examined through an interdisciplinary analysis, reveal about their lifecycle (production, use, and repurposing)?

The individual case studies within this research are structured around four overarching themes. Each of these research themes comprises one or two sub-studies, which have been developed independently and are presented in separate chapters. These chapters are preceded by an overarching study that provides a broad contextual framework (chapter 2). The findings of each case study are presented in separate chapters, each guided by its own research question and addressing a distinct aspect of a cask's lifecycle. The overview below presents the question addressed in each chapter.

Overarching

Chapter 2: What is the nature and duration of a cask's lifespan?

Production

Chapter 3: To what extent can casks found in Dutch archaeological contexts be distinguished as locally produced or imported, based on the provenance of the timber and its diachronic patterns?

Chapter 4: How did cask production in the Netherlands develop diachronically in terms of organization, production technique, and pricing in the Late Middle Ages and the Early Modern period?

Use as transport containers

Chapter 5: How can Dutch herring and beer casks that were produced in the 15th till 18th centuries be identified?

Repurposing

Chapter 6: 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?

Cask marks

Chapter 7: What typology can be established for cask marks from Dutch archaeological contexts (1300–1800), and to what extent is this typology suitable for categorizing cask marks?

The research presented in Chapter 7 enabled the identification of the shipwreck BZN4 based on several marks linked to individual persons. As a result, a sub-study of this shipwreck was conducted, which is presented in Chapter 8 along with the following research question.

Chapter 8: To what extent can the shipwreck BZN4 be reliably identified as the ship *'t Hart*, based on its archaeological characteristics?

In some of the substudies, case studies have been employed, resulting in more specifically formulated research questions. The extent to which these case studies can be considered representative of the broader research theme, the entire study area, and the full chronological scope of 1300–1800 will be critically assessed in chapters containing the respective substudies, as well as in the conclusion. In the conclusion, presented in Chapter 9, the research results will be placed within a broader context to address the central research question of this dissertation.

1.5 Source material and datasets

The results of the substudies regarding the four research themes are presented in eight chapters, each addressing a subquestion, as outlined in section 1.4. Every of these sub-studies follows a consistent research framework and is structured uniformly throughout the dissertation. For each, a dataset was compiled, forming the empirical basis for the analysis. The data used and supplementary analyses are described in section 1.5.1, while the scope and nature of the dataset are outlined in section 1.5.2. Each chapter opens with an introduction that frames the

specific question being addressed. This is followed by a detailed explanation of the research methodology used, alongside a discussion of the relevant sources, including historiographical context if needed. The core of each chapter presents the results of the analysis, leading to a concluding section that reflects directly on the chapters' research question and its implications.

The organization of the chapters follows the chronological phases of a casks' lifecycle, ensuring a continuity between chapters. In several cases, components of datasets created for one sub-study were used or expanded in another investigation. For instance, the dendrochronological dataset introduced in Chapter 3, which focuses on cask parts from Dutch urban archaeological contexts, was later enriched with additional data from maritime contexts and cask finds from maritime contexts outside the Netherlands. This expanded dataset served as the foundation for the broader inquiry into the lifecycle and lifespan of casks, the results of which are presented in Chapter 2. Although some of the datasets overlap, each dataset produced for the respective sub-studies is treated as a distinct entity.

The sub-studies presented in Chapters 1 through 8 have been disseminated through various publications, including five peer-reviewed journal articles and one online database (Table 1.1). These five peer-reviewed articles were prepared for inclusion in this dissertation and incorporated as individual chapters. To ensure consistency in style and presentation across the dissertation, minor editorial revisions were implemented, including formatting adjustments, improvements in clarity, and small modifications to wording. These changes were strictly editorial in nature and did not affect the original content, results, or conclusions of the articles.

Only Chapters 4 (Production of Casks in the Netherlands), 6 (Repurposing of Casks), and 7 (Typology for Cask marks) were not published as peer-reviewed articles. By incorporating these studies, the research captures all phases of the casks' lifecycle, offering a comprehensive understanding of its various phases. This approach positions the dissertation as a hybrid format, combining elements of both a monograph and article-based dissertation. The final chapter (Chapter 9) compiles the results of the individual studies in the context of the central research question. It draws together the key insights from each chapter to present a comprehensive analysis of a casks' lifecycle and its broader socioeconomic implications. Special consideration is given to the representativeness and limitations of the findings, particularly in sub-studies based on limited or imbalanced datasets. The chapter concludes by identifying opportunities for future research and highlighting possible avenues for further exploration of the archaeological significance and historical role of casks in trade and daily life.

1.5.1 Source material

This study adopted an multidisciplinary research design, integrating archaeological, dendrochronological, historical, iconographic, and material data from museum collections. In addition, further data were collected through 3D scanning, photometric stereo techniques, and interviews with present-day coopers practicing traditional methods. This multidisciplinary approach proved methodologically fruitful, as it enabled the analysis of casks not merely as material remains, but as historically embedded artefacts with social, economic, and technological significance. The integration of material and textual sources enriched the interpretative depth and provided multiple layers of evidence for reconstructing the casks' lifecycle.

Although this study employs a multidisciplinary approach, the archaeological data remain fundamental. This focus aligns with the overarching aim to reconstruct the lifecycle of casks recovered from archaeological contexts. From this perspective, the research must be regarded first and foremost as situated within the archaeological domain. The primary data originate from archaeological contexts, whose principal value lies in the opportunity they offer to be examined collectively, an approach not previously undertaken in this manner.

Due to urban development-driven archaeology in the Netherlands following the adoption of the Valetta Convention, Dutch archaeology has changed drastically. In recent decades, the amount of archaeological research has expanded rapidly.³⁶ In particular, the past two decades have seen a significant increase in archaeological research in historic Dutch city centers, largely in response to intensive urban redevelopment. These urban environments are especially conducive to the recovery of casks, as waterlogged conditions and deep stratigraphy often allow for the preservation of organic materials in archaeological contexts.³⁷

The information derived from the archaeological investigations in which these casks were recovered, including dating, find location, and contextual associations, has been supplemented with data from dendrochronological analyses, which provided insights into provenance and further refinement of the chronological framework. In addition, casks recovered from archaeological contexts were further examined within several sub-studies through the application of 3D scanning (Chapter 4) and photometric stereo techniques (Chapter 7).

Additional data sources were employed to contextualize and, where necessary, supplement the data from archaeological contexts. Across all of the sub-studies (Chapters 2–8), written sources were consistently utilized, while in specific cases iconographic material (Chapters 5, 6 and 7), museum objects (Chapters 5 and

³⁶ Eerden et al., 2017.

³⁷ Cleijne et al., 2017.

7), and interviews with present-day coopers (Chapters 2, 4 and 7) were also incorporated to provide complementary perspectives and enhance interpretative depth.

The majority of additional data comes from written sources, which, as noted, were primarily used to contextualize and supplement the archaeological evidence. For example, in Chapter 3, the provenance of coopers' timber is analyzed to reconstruct trade flows. To provide historical context for the archaeological data, information from sources such as the Sound Toll Registers was used to situate these trade flows within the broader exchange networks between the Baltic Sea region and the Netherlands.

Written sources are considered supplementary when they provide information on aspects of the cask lifecycle that cannot be inferred from archaeological data. An example is the specifications of beer casks recorded in urban ordinances issued by coopers' guilds. No beer casks containing beer have been recovered from archaeological contexts, as they were emptied in urban settings and beer casks on sunken ships were washed out. Consequently, beer casks cannot be confidently identified archaeologically, and their characteristics are instead obtained from written sources, which in such cases serve as supplementary rather than purely contextual data.

This dissertation is based on a total of eight sub-studies. The results of the first sub-study are presented in section 1.2, while the remaining sub-studies are discussed in Chapters 2 through Chapter 8. Each sub-study relies on a separate dataset and a distinct selection of supplementary analyses of the archaeological material, as well as additional data sources from outside the archaeological discipline. The specific source materials actually used in each sub-study are detailed in the "Sources and Methods" sections of the respective sub-studies. This is particularly important for the written sources, which encompass a diverse range of archival materials, including, among others, the archives of urban coopers guilds, to urban ordinances, to the archives of private commercial organizations such as the Sociëteit van Suriname. The table below presents, for each sub-study, a detailed overview of the data sources used, the supplementary analyses performed on casks from archaeological contexts, the additional data sources drawn from outside the archaeological discipline, and the corresponding publications.

Table 1.1: Overview of the supplementary analyses of archaeological data and of the additional sources incorporated in each chapter.

Chapters	Ch. 1	Ch. 2	Ch. 3	Ch. 4	Ch. 5	Ch. 6	Ch. 7	Ch. 8
Archaeological data	✓	✓	✓	✓	✓	✓	✓	✓
Additional analyses								
Dendrochronological analyses		✓	✓			✓	✓	✓
3D-scanning				✓				
Photometric stereo techniques							✓	
Additional data sources								
Written sources	✓	✓	✓	✓	✓	✓	✓	✓
Iconographical data					✓	✓	✓	
Museum collections					✓		✓	
Interviews with present-day coopers		✓	✓	✓			✓	
Related publication	Publication 1	Publication 2	Publication 3		Publication 4		Publication 5	Publication 6

The last row of Table 1.1 indicates which publications have resulted from the sub-study presented in the corresponding chapters. These publications are listed below, with each entry specifying whether it is a peer-reviewed article or an online database:

- Publication 1 (peer-reviewed article): Oosterbaan, J. (2024). Tonnen en vaten. De Zeecontainer van de Late Middeleeuwen. *Madoc*, 39(3-4), 169-182. <https://doi.org/10.5117/MADOC2023.3-4.006.OOST>
- Publication 2 (peer-reviewed article): Oosterbaan, J. (2025). Lifespan of Casks. *International Journal of Wood Culture* (published online ahead of print 2025). <https://doi.org/10.1163/27723194-bja10037>
- Publication 3 (peer-reviewed article): Oosterbaan, J., Doeve, P., & van Daalen, S. (2022). Provenance and Production: Casks in the Dutch Archaeological Context. *International Journal of Wood Culture*, 3(1-3), 412-441. <https://doi.org/10.1163/27723194-bja10007>
- Publication 4 (peer-reviewed article): Oosterbaan, J. (2023). Identifying Content through Casks. *Skyliiss: Journal of Maritime and Limnetic Archaeology and Cultural History* (23), 103-116
- Publication 5 (online database): Database WOODAN Cask Marks (2024). University of Leiden. Available online at: www.woodancaskmarks.org

- Publication 6 (peer-reviewed article): Tran, L., Oosterbaan, J., Vos, A.D. et al. The Coffee was Paid for Dearly: Shipwreck BZN4 and the Frigate't Hart. *J Mari Arch* (2025). <https://doi.org/10.1007/s11457-025-09458-2>

1.5.2 Datasets

As outlined in section 1.5, a separate dataset was established for each sub-study, each of which is regarded as a distinct entity. These datasets comprise a unique set of supplementary analyses of casks from archaeological contexts and additional data sources (Table 1.1). To provide insight into the scope of each dataset and the nature of the material used, a description is provided below for each sub-study.

Chapter 2: The Lifecycle and Lifespan of Casks

This chapter is based on 464 casks from archaeological contexts, all of which were successfully dated using dendrochronology. These include 345 casks from urban archaeological contexts and 119 from maritime archaeological contexts. The consulted written sources used consisted mainly of urban ordinances from cities such as Gouda and Haarlem. Information from present-day coopers helped to further interpret the results.

Chapter 3: Provenance and Production

This chapter draws on data from 357 casks, all of which were successfully dated using dendrochronology. These include 345 casks from urban archaeological contexts and 18 from maritime archaeological contexts. In addition, this sub-study made extensive use of written source material from the Sound Toll Registers (1497-1857), the Zaandam Timber Auctions (1655-1811), and the Database of Dutch Craft Guilds (1200-1900).

Chapter 4: The Production of Casks in the Netherlands

This chapter is based on four 3D-scanned casks but primarily draws on overview studies by other researchers. This information was supplemented with written sources from the Database of Dutch Craft Guilds (1200-1900) and archival records from coopers' guilds in cities such as Amsterdam, Vlissingen, Veere, Gouda, Haarlem, Dordrecht, and Rotterdam. In addition, interviews with present-day coopers were conducted to further elaborate on the cask production practices.

Chapter 5: Identifying Contents through Casks

The sub-study presented in this chapter primarily draws on written sources, including legislation from various levels of authority, namely urban, provincial, and broader jurisdictions such as the Habsburg Empire. However, the most consulted sources consist of urban ordinances from cities such as Gouda, Haarlem, Dordrecht,

Amsterdam, and Leiden, along with archival material from organizations like the College van de Grote Visserij. In addition, extensive use was made of iconographic sources and objects from museum collections. Archaeological data, which is very limited available for this sub-study's research topic, is subsequently used to corroborate and verify the findings based on written sources.

Chapter 6: Repurpose of Casks

This chapter draws on 226 casks from urban archaeological contexts in Vlissingen, including both dendrochronologically analyzed and unanalyzed examples. To identify and classify different forms of cask repurpose, the RKD (Netherlands Institute for Art History) database was consulted. On a smaller scale, written source material was also consulted in this sub-study to estimate the construction costs of a water wells.

Chapter 7: Typology for Cask marks

A total of 1,901 cask marks are analyzed in this chapter, with 1,021 from archaeological contexts and 880 from historical sources. The cask marks from archaeological contexts can be further subdivided into 405 from maritime contexts, 527 from urban contexts, and 89 from rural contexts, a segment of which has been dated using dendrochronological analysis. The 880 cask marks derived from written sources were collected from various archival repositories, including the Craft Guild Archives of Zierikzee and Veere, the Amsterdam Notarial Archives, and the Archive of the Middelburgsche Commercie Compagnie. To examine the cask marks from archaeological contexts in detail, photometric stereo techniques were subsequently used.

After compiling the dataset, the interpretation of the cask marks relied primarily on written sources, supplemented by museum objects, iconographic material, and interviews with present-day coopers. These sources were used selectively and purposefully. When marks from archaeological contexts could not be interpreted, written records were consulted first; if these proved insufficient, additional sources were employed. For example, construction marks, which are poorly documented in written sources, were discussed with present-day coopers to better understand their function.

Most information came from written archives, particularly the coopers' guild records from cities such as Haarlem, Breda, Amsterdam, Veere, Dordrecht, and Vlissingen. In addition, urban ordinances from Gouda, Haarlem, and Dordrecht, as well as archives of organizations like the College van de Grote Visserij, were consulted.

Chapter 8: The coffee was paid for dearly. Case study

This sub-study differs slightly in its design from the other case studies, as its initial aim was to identify a shipwreck. The assemblage from the BZN4 wreck, which included 47 documented casks, served as the primary point of departure for this investigation. The remaining recovered material and the ship's construction were also examined, with dendrochronological analysis playing a central role in determining their age. The written sources consulted mainly comprise the Amsterdam Notarial Deeds, the Archive of the Sociëteit van Suriname, the Suriname Church Records of Christenings, Marriages and Burials (DTB), and the Suriname Notarial Deeds.

Data Availability Statement:

The datasets and related materials supporting the findings of this study have been deposited in the DANS Data Station Archaeology repository under the title *The Lifecycle of Casks* and are openly accessible via <https://doi.org/10.17026/AR/IUWVEC>. The data are publicly available without restriction and can be reused in accordance with the repository's terms of use.

1.5.3 Dataset delimitations

The geographical scope of this study is confined to the present-day boundaries of the Netherlands. This delimitation is not only a consequence of the practical constraints imposed by the PhD project's timeframe, but also reflects the relative ease of access to Dutch datasets and the consistency of the country's archaeological research tradition. The standardized nature of data collection within the Netherlands, as well as the researcher's familiarity with these datasets, further contributed to this decision.

In some chapters, datasets with data from Dutch archaeological contexts have been strategically supplemented with data from outside the Netherlands to enhance contextual understanding or address gaps. Moreover, international literature and written sources have been extensively consulted, reflecting the inherently transnational nature of cask circulation, which often transcended present-day national boundaries. As such, this research holds relevance for an international scholarly audience and justifies the choice to present the dissertation in English.

This study encompasses a broad chronological scope, focusing on the period 1300–1800, a span of five centuries marked by a profound socioeconomic transformation in the Netherlands. The rationale for selecting the timeframe lies in the central role played by trade during these centuries, much of which relied on the use of casks as the primary container for transporting goods. The importance of casks in this context is evidenced by the establishment of 38 coopers' guilds across the Netherlands, the earliest of which was founded in Sluis in 1397 (Figure 3.6).

Many of these guilds remained active well into the 20th century, highlighting the long-standing significance of cask-related craftsmanship and commerce.

In addition, the period 1300 to 1800 provides relatively rich archaeological evidence for the study of casks. A significant portion of the cask assemblages in the dataset is derived from urban archaeological contexts, where they were repurposed as cesspits and wells. This era is often referred to as the “cesspit period” due to growing urban populations which brought about an increasing concern for sanitation and hygiene. The widespread construction and use of cesspits reflect broader societal shifts toward regulating the management of domestic waste. The end of this period coincides with the transition to more modern forms of waste management, such as the development of urban sewer systems.³⁸

The period 1300 to 1800 also provides a substantial body of maritime archaeological data, comprising the numerous shipwrecks discovered in Dutch waters. According to the Maritime Stepping Stones (MaSS) database, which catalogs approximately 1,500 shipwrecks, over 450 were found within Dutch maritime boundaries and can be connected in this timeframe.³⁹ This significant representation underscores the vital maritime component of trade during this era and emphasizes the relative abundance and accessibility of maritime archaeological evidence from this period.

Research spanning 500 years, in the tradition of Braudel's *longue durée*, allows for the examination of broad, structural developments rather than granular, short-term fluctuations. When studying casks within this framework, a considerable number of data points can be collected from archaeological contexts spanning the Late Middle Ages and the Early Modern period. However, it is important to acknowledge that, despite this relative abundance, the datasets compiled for the research represents only a small fraction of the total number of casks that would have circulated during this extensive timeframe.

The delimitation of source material from outside the archaeological discipline also requires clarification. In each sub-study, written sources were employed primarily to contextualize and supplement the archaeological data.⁴⁰ The sources used, however, represent only a portion of the available material and should by no means be considered a complete record of information. For example, archives of the various coopers' guilds within present-day Netherlands are highly informative about cask production. Although 38 such guilds are known, only nine were examined in the different sub-studies of this dissertation.⁴¹ The selection of specifically these nine coopers' guilds is based on the fact that they were located in cities with the greatest potential demand for casks, due to the prominent role of urban herring fisheries and

³⁸ Van Oosten, 2015, 18.

³⁹ Database Maritime Stepping Stones (MaSS), 2020.

⁴⁰ Carmiggelt, 2006.

⁴¹ *The coopers' guilds of Alkmaar, Amsterdam, Breda, Dordrecht, Gouda, Haarlem, Rotterdam, Veere, and Vlissingen.*

breweries. Additionally, these cities are located in the western Netherlands, the region where the majority of casks have also been recovered from archaeological contexts.

Other types of source material, including iconographic data, museum collections, and interviews with present-day coopers, are similarly incomplete. These data sources were primarily used when archaeological casks could not be further interpreted based on their features and information from written sources. In such instances, these supplementary sources were employed strategically to address gaps. For instance, when researching iconographic material, specific paintings listed in the RKD Netherlands Institute of Art History database were consulted.⁴² This database allows targeted searches by keywords and contains many relevant historical paintings and etchings, but it does not cover all possible examples.

This inherent delimitation means the data used in this dissertation cannot provide a comprehensive or fully representative account of all cask production, use, and repurposing throughout the research period. Consequently, detailed, period-specific conclusions remain difficult to substantiate. Rather, the used data is better suited for identifying overarching patterns and long-term trends in casks' lifecycles. This research can thus be regarded as pioneering, as it outlines the major developments and overarching frameworks related to casks over a long time span. It establishes a foundational understanding of the casks' lifecycle, in other words its *chaîne opératoire*, as described in the theoretical framework (Section 1.3.1). Only after this lifecycle is understood can the subsequent step be taken: situating the cask within the maritime cultural landscape (Section 1.3.2). In doing so, this dissertation also aims to provide a basis upon which future studies can build.

1.6 Terminology

This study hinges on two "container" terms, *vat* (cask) and *ton* (barrel), whose meanings have shifted across time and place. According to the modern Van Dale dictionary, a *vat* is any cylindrical receptacle, while a *ton* is a wooden *vat* that bulges at the centre.⁴³ Although present-day Dutch often treats them as synonyms, product-specific compounds e.g., *wijnvat* (wine cask) and *haringvat* (herring cask) versus *regenton* (rain barrel) and *turfton* (peat barrel) hint at earlier distinctions. Medieval sources confirm this tension: historian Alberts found the two labels used interchangeably for beer⁴⁴, and Verhoeff noted their application to both wet and dry goods.⁴⁵ When the metric system was introduced in the Netherlands 1820, a concordance was compiled in which the old units were listed alongside the metric equivalents. In this overview, only the term *vat* (cask) was included, with its volume set at 100 liters.⁴⁶

⁴² Database RKD Netherlands Institute of Art History, n.d.

⁴³ Database Van Dale Online, n.d.

⁴⁴ Alberts, 2010, 125–126.

⁴⁵ Verhoeff, 1983, 128.

⁴⁶ Verhoeff, 1983, 132.

Etymology reveals deeper contrasts. *Vat* appears in 10th-century Dutch texts meaning “container” or even “instrument.”⁴⁷ In the Late Middle Ages, however, the meaning of the term *vaten* was more commonly used as a synonym for a container or, as in the following phrase, c. 1265–1270, a coffin: “*Die dat beslogen in din vate*” (who laid the body to rest in the coffin). In a phrase from 1276–1300, *vat* is used in its modern sense as a wine container: “*een vat dat vol van wine ware*” (a cask full of wine). Later, the term came to refer more broadly to wooden, stone, or metal vessels used to hold, carry, or store contents.⁴⁸

On the other hand, the Dutch word *ton* has several meanings within the system of measurements and weights:

- Transport container
- The load capacity of a transport vessel
(e.g., *tonnage* refers to a ship’s cargo capacity)
- A unit of weight, specifically 1,000 kilograms
- A monetary unit, namely 100,000 (e.g., euros or guilders)

This study focuses only on the meaning of *ton* as a transport container. However, the other meanings consistently show that *ton* refers to a fixed unit. Both the weight and monetary measures were standardized, so it is evident that *ton* as a transport container also denoted a set volume. This is supported by the term’s etymology, indicating a fixed capacity for goods stored in a *ton*.⁴⁹

In the Late Middle Ages and much of the Early Modern period, the term *ton* (barrel) appears to differ from *vat* (cask). *Vat* was used as a general umbrella term for containers, while *ton* referred to containers made to specific sizes for particular products. Examples include the Dutch terms *harington* (herring barrel) and *bierton* (beer barrel), which were produced according to standardized specifications. This distinction likely explains why the terms *haringvat* and *biervat* were avoided, as *ton* referred to a specifically regulated transport container, whereas *vat* functioned as a more general designation for vessels of varying size and purpose. In this study, these terms will be used as outlined in Table 1.2.

⁴⁷ Philippa et al., 2003.

⁴⁸ Philippa et al., 2003.

⁴⁹ Philippa et al., 2003.

Table 1.2: Overview of the meaning and translations of the terms vat and ton.

Dutch	English	Old Dutch ⁵⁰	German	French	Definition
Vat	Cask	<i>Vat, fat</i>	<i>Fass</i>	<i>Fût</i>	Wooden transport container with a cylindrical shape, in which the belly diameter is greater than the diameter of the ends.
Ton	Barrel	<i>Ton, tunna, tonne</i>	<i>Ton</i>	<i>Baril, tonne, tonneau</i>	Similar to a vat but constructed according to prescribed dimensions.

Furthermore, this study employs various terms that refer to the specific components of casks. To clarify which components are being discussed, the figure below provides a schematic overview of the relevant parts in both English and Dutch (Figure 1.7).

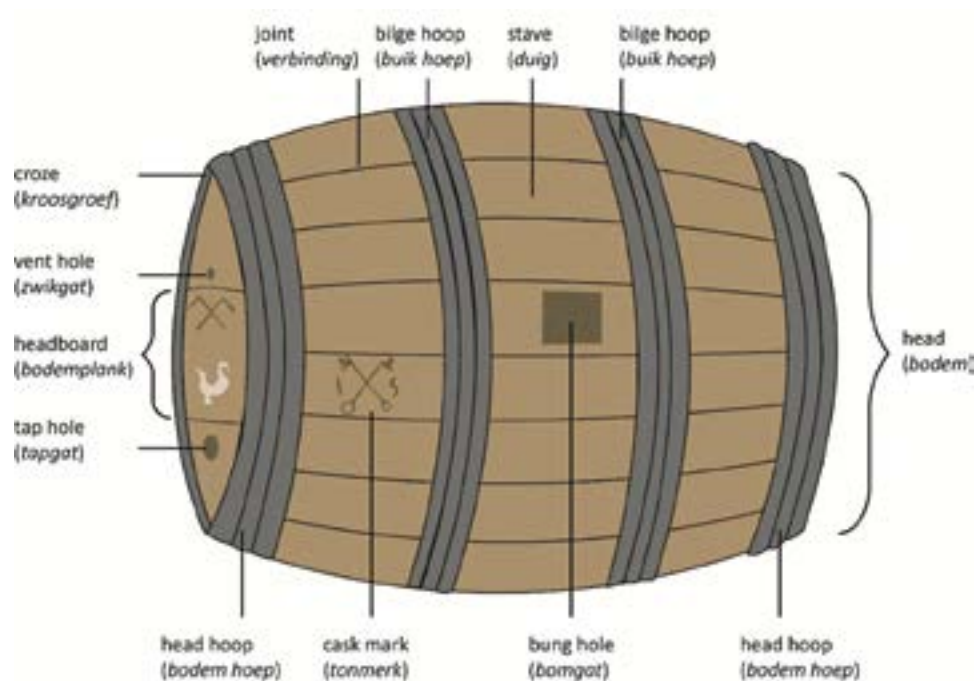


Figure 1.7: Schematic overview of the components of a cask, English and Dutch.

Several geographical terms used in this dissertation require clarification, as their historical and spatial meanings vary considerably. The Netherlands is used in a general and pragmatic sense to denote the territory corresponding to the present-day borders of the country. For much of the period under study (1300-1800), this area did not constitute a unified political entity, and both its administrative structure and territorial boundaries shifted considerably over time. The term

⁵⁰ Database Historical dictionary of Dutch and Frisian, n.d.

therefore serves as a collective term, used strictly in a geographical sense and not as an anachronistic reference to the modern nation-state.

The Low Countries refers to a broader historical-geographical region, encompassing not only present-day the Netherlands but also large parts of present-day Belgium, most notably Flanders and Brabant. Its use thus reflects a wider regional configuration that transcends contemporary national borders.

The Dutch Republic is the conventional historiographical designation for the Republic of the Seven United Netherlands (1588–1795). It is reserved for contexts in which a more specific political and temporal framing is required, particularly where questions of institutional structure, sovereignty, and political development are central to the analysis.

