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Small inland shipping in the Netherlands: Operating below the radar?

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ABSTRACT

As the need for more sustainable and flexible transport continues to grow, inland shipping is emerging as a sector of interest. This paper is about small inland shipping in the Netherlands with a focus on dry cargo ships. There is currently only a limited number of studies specifically focussed on small dry cargo shipping. It has been at the centre of a societal and political debate in the Netherlands in which it has alternately attracted both positive and negative views. The recurring themes in this debate have been the shrinking of the fleet, the age of ships, the lack of entrepreneurial spirit among skippers and the sustainability of small inland shipping. Despite these discussions, there is currently no analysis of the dry cargo shipping market in the Netherlands.

This paper presents an analysis of small dry cargo shipping in the Netherlands from three perspectives: fleet, cargo transport and inland ports. The analysis revealed that the size of the Dutch active small fleet is decreasing significantly. The transport performance also follows a negative development trend. However, there are also positive developments such as a slight increase in the number of trips, the average number of tonnes per loaded trip, the average number of kilometres per loaded trip and the average load factor. Another positive development is the increase in cargo throughput at inland ports situated along small waterways. Previous studies used different market definitions of small dry cargo shipping. This has an impact on the assessment of small dry cargo shipping's development.

1. Introduction

A future increase in freight volumes is expected to put pressure on the existing transport network in Europe. The interest in inland shipping is growing given the almost unlimited capacity of the European inland waterway infrastructure and the need for more sustainable transport (European Commission, 2011). This paper is about small inland shipping in the Netherlands with a focus on dry cargo ships.

The Netherlands was chosen for a number of reasons. First, the length of the Dutch inland waterway network is 6,228 km, of which 3,310 km are small waterways. In 2019, 349 million tonnes is transported by inland ships in the Netherlands, of which 185 million tonnes is dry cargo. About 40 % of dry cargo is transported by small barges. Second, the current performance and future development of inland shipping in general and small inland shipping in particular have been part of a societal and political discussion in the Netherlands. The Dutch government has strong ambitions for developing inland shipping as a reliable and sustainable mode of transport. Moreover, inland shipping is seen as an important alternative mode of transport for relieving the dense and congested road infrastructure (Ministry of Infrastructure & Environment, 2012).

The above-mentioned societal and political discussion is also related to dry cargo ships, which make up the largest share in the Dutch inland fleet (IVR, 2019). There are both negative and positive public perceptions of small dry cargo shipping. One the one hand, there is a perception that the inland shipping sector is permanently in crisis: the fleet is declining, the industry is not meeting emission regulations, and the 'greening' of the fleet is proceeding at low speed. On the other hand, small dry cargo shipping has been assigned an important logistical function in terms of sustainability and flexibility since it is essential for shippers and industries located in the capillaries of the waterway system (Buck, 2008). Shippers of for example sand, gravel and agri bulk in the Netherlands are highly dependent on inland shipping (BLN-Schuttevaer, 2018). A modal shift of theses goods from inland shipping to road is not

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desirable for the Dutch transport policy ambitions.[1]

Despite the considerable interest in small dry cargo shipping there is no analysis of the dry cargo shipping market in the Netherlands. The goal of this paper is to gain a better understanding of the state of small dry cargo shipping in the Netherlands by finding out how the sector is performing and what knowledge and data are available. A better understanding of the performance of this specific sector is an important condition for discussions about and with the sector and for formulating future policies. Section 2 of this paper is the review of the existing literature on small inland shipping from the academic, policy and business perspectives. Sections 3 and 4 describe data collection, adjustment and analysis from the perspectives of the fleet, transport and inland ports. In the analysis, small inland shipping was defined for vessels in CEMT classes 0–4,[2] which have a maximum length of 85 m and a maximum loading capacity of 1,500 t. This definition is adopted in the Netherlands mainly by policy makers and businesses (see e.g., EICB, 2011; ASV, 2011). Section 5 provides the conclusion and implications for further research and possible implications for policy.

2. Literature

Inland shipping is a hybrid market with various possible combinations of ship types and cargo. Nevertheless, many studies focus on the inland shipping market as a whole and deal with a particular subjects such as fleet optimisation and timing issues (Bush et al., 2003; Swedish, 1998), transport safety (Roeleven et al., 1995), innovation (Wiegmans & Konings, 2007) and effects of climate change and sustainability development goals (Jonkeren et al., 2007; Schweighofer, 2014). In the group of studies that address inland shipping from the cargo perspective, there is an increasing body of knowledge about inland shipping of containers. These studies address different issues such as network optimisation (e.g., Konings, 2009) or organisational matters (e.g., Van der Horst et al., 2019). Dry cargo shipping is less studied. The existing studies cover topics such as the optimal size of dry bulk ships (Hekkenberg, 2016) or the reactivation of small waterways through new ship and network design (Van Hassel, 2011, 2015). Both studies are unique because they are one of the few studies that focusses on small ships.

Studies on inland shipping are often related to one waterway or region. The work of Van Hassel (2011, 2015) applies to Belgium, where 85 % of the waterways are small waterways (See Appendix 2, Table 11). Surprisingly, no studies have been found on France, where 70 % of the waterways belong to classes 1–4. In the Netherlands, this share is 53 % although there are no academic studies on small inland shipping in the Netherlands either. Outside Europe, the literature about small inland shipping in China might be relevant since China has the world's largest inland waterway network of 126,300 km (Asian Development Bank, 2016). The Chinese studies mainly focus on the lack of intermodal innovations, the deterioration of waterways and the social problems of skippers and their families (Asian Development Bank, 2016; Wang and Li, 2012).

There are two Dutch vision studies that address small dry cargo shipping from the policy and business perspectives. A study by Adviesdienst Verkeer en Vervoer (AVV, 1999) was commissioned by the Ministry of Transport, Public Works and Water Management. It was written against the background of the liberalisation of the European transport market in 1998, the national vessel-scrapping schemes and the 'old-for-new' system for the inland fleet.[3] In the late 1990 s, the most pressing concern was the disappearance of small ships. The second vision document was written by Buck (2008). This study also addresses the shrinking fleet but starts with a more positive point: "[There] is a future for small ships, because research shows that they can compete with road transport. The government's ambition is to combine the necessary innovation in inland shipping with the preservation of small ships and their market share" (Buck, 2008, p. 3). It is worth noting that the two documents exhibit considerable overlap in addressing other topics as well. First, they emphasise the opportunities of small inland shipping for shippers in terms of sustainability and flexibility in serving the capillaries of the waterway network. Second, they address some negative aspects such as the declining fleet, the lack of entrepreneurial spirit among skippers and the negative 'green image' (sustainable among shippers. The last point is closely related to the high age of small ships. Finally, the market structure and lack of cooperation is addressed both in AVV (1999) and Buck (2008). The small dry cargo market is characterised by strong price competition since there are many small inland shipping companies on the supply side and large shippers on the demand side. Increased cooperation among skippers could provide them with a better negotiating position with shippers or charterers.

The above-mentioned issues have been addressed for many years. It seems difficult to make progress on it, and in a way, it confirms the alternating positive and negative connotations about small dry cargo shipping in the Netherlands. It is important to note that neither of the two vision documents provides an analysis of small dry cargo shipping in the Netherlands. Although there are some studies (e.g., Panteia, 2018) that address expectations about the future, a performance analysis of the fleet development, cargo transport and inland ports in the capillaries of the Dutch waterway network is lacking.

The literature review indicates that there is no universally accepted definition of small inland shipping but many different definitions (see Table 1). This research defines small inland shipping as utilising vessels in CEMT classes 0–4 (maximum length of 85 m, maximum load capacity of 1,500 t). The same definition is used in the aforementioned vision documents (AVV, 1999; Buck, 2008) and in a document by the Algemeene Schippersvereeniging (ASV, 2011). The ASV is the sector association for private skippers, and skippers with small ships are overrepresented in it. Van Hassel's Belgian study (2011) defines small inland shipping vessels as belonging to CEMT classes 0–2. Panteia (2018) defines small inland ships as vessels with a maximum loading capacity of 800 t (CEMT classes 1, 2 and partly 3).

3. Indicators and data

It appears that the literature contains no analysis of the current performance of small inland shipping in the Netherlands. Nevertheless, many data for such an analysis are available. Table 2 provides an overview of the data on small inland shipping in the Netherlands that are available and up-to-date. The indicators are divided into three groups depending on whether they relate to the perspective of the fleet, transport or inland ports. The indicators chosen closely match those in other existing national and European monitors for (maritime) freight transport as Dashboard Freight Transport (Statistics Netherlands, 2021), Maritime Monitor (Ecorys, 2020) and Market Observation Inland Shipping in

[1] Also a shift from small inland shipping to railway transport is not desirable and seems less obvious. The lack of modal competition between small inland shipping and railway can be explained by the fact that railway is often chosen for 'full train loads' (one train of +/- 4.000 tonnes). Moreover, there are 'only' 26 loading sites for rail in The Netherlands (Railcargo, 2019).. A small proportion of these are equipped with loading and unloading facilities. The majority of sites equipped with load and unlading facilities are located in the main seaports, and in the proximity of small waterways.

[2] 'CEMT-class is the common used size indicator for inland vessels in Europe. The system is called 'CEMT' because the class division isdetermined by 'Conférence Européenne des Ministres de Transport' (European Conference of Ministers of Transport (ECMT), 1992). The classes are classified on the basis of a ship's length, width, height and maximum load capacity (see appendix 1, Table 10).

[3] The old-for-new system was linked to scrapping schemes. It is a way to regulate fleet capacity whereby the owner who wants to bring a new vessel into the fleet had to either scrap old vessel tonnage or pay money. This rule came to an end in 2003.

Table 10
Appendix 1 Overview of CEMT ship size class: characteristics normative ships.

CEMT Class	Name	Width (m)	Length (m)	Draft (loaded) (m)	Load capacity (t)	Width and length (m)
0	Other				1–250	W≤ 5,00 or L≤ 38,00
I	Spits	5,05	38,5	2,5	251–400	W = 5,01–5,10 and L≥38,01
II	Kempenaar	6,6	50–55	2,6	401–650	W = 5,11–6,70 and L≥38,01
III	Hagenaar	7,2	55–70	2,6	651–800	W = 6,71–7,30 and L≥38,01
	Dortmund Eems (L ≤ 74 m)	8,2	67–73	2,7	801–1050	W = 7,31–8,30 and L = 38,01–74,00
	Verl. Dortmund Eems (L > 74 m)	8,2	80–85	2,7	1051–1250	W = 7,31–8,30 and L≥74,01
IVa	Rijn-Herne Schip (L ≤ 86 m)	9,5	80–85	2,9	1251–1750	W = 8,31–9,60 and L = 38,01–86,00
	Verl. Rijn-Herne (L > 86 m)	9,5	105	3,0	1751–2050	W = 8,31–9,60 and L≥86,01
Va	Groot Rijnschip (L ≤111 m)	11,4	110	3,5	2051–3300	W = 9,61–11,50 and L = 38,01–111,00
	Verlengd Groot Rijnschip (L > 111 m)	11,4	135	3,5	3301–4000	W = 9,61–11,50 and L≥ 111,01
VIa	Maatg. Schip 13,5 * 110 *m*	13.50	110	4,0	4001–4300	W = 11.51–14.30 and L = 38.01–111.00
	Maatg. Schip 14.2 * 135 *m*	14.20	135	4,0	4301–5600	W = 11.51–14.30 and L≥ 111.01
	Rijnmax Schip	17,0	135	4,0	≥5601	W≥ 14.31 and L≥ 38.01

Source: Rijkswaterstaat (2010), adapted by authors.

Table 11
Appendix 2 Length of waterways in kilometres by CEMT class in eight European countries.

Country	1	2	3	4	5	6	7	Share 0–4	Total
Belgium	533	484	127	6,936	792	591		85 %	9,463
France	6,692	580	149	194	2,891	200	196	70 %	10,902
Germany	1,012	395	388	2,989	4,396	3,292		38 %	12,472
Netherlands	240	1,567	306	1,197	1,581	1,337		53 %	6,228
Luxemburg					37			0 %	37
Austria						360		0 %	360
Switzerland					17	5		0 %	22
Poland	110	1,761	1,905	275		151		96 %	4,202

Source: Bureau Voorlichting Binnenvaart (2016), adapted by authors.

Table 1
Definitions of small inland shipping.

Source (author)	CEMT class	Max. length (m)	Max. loading capacity (t)
Future Perspectives Small Ship (AVV, 1999)	unknown	73	1,000
Vision Small Inland Shipping (Buck, 2008)	1, 2, 3 and 4	85	1,500
'Small Inland Shipping, Worth It' (ASV, 2011)	1, 2, 3 and 4	85	1,500
Action Plan Small Inland Shipping (EICB, 2011)	1, 2, 3 and 4	85	1.500
Reactivation of Small Inland Waterways Belgium (Van Hassel, 2011)	1 and 2	55	650
Medium Term Forecasts Inland shipping (Panteia, 2018)	1, 2 and partly 3	70	800
Non-TEN-T corridor (EC, 2019)	1, 2 and 3	85	1,250

Table 2
Indicators and data sources used.

Perspective	Indicator	Source
Fleet	Registered Dutch dry cargo fleet	International Association the Rhine Ships Register (IVR, 2019)
	Active dry cargo fleet	Network Information System (NIS) of Rijkswaterstaat
Transport	Number of trips	Inland Waterways Analysis System (BIVAS) of Rijkswaterstaat (Rijkswaterstaat, 2019a)
	Average tonnes per trip	
	Average distance per trip	
	Transport performance of ships (in tonne-kilometres)	
	Load factor (%)	
Inland ports	Throughput at inland ports along small waterways	Statistics Netherlands (2019)

Europe (CCNR, 2020) Data sources are provided for each indicator. This section describes how data were collected and, where necessary, adjusted.

Regarding the fleet, we distinguish the registered fleet and the active fleet. The registered fleet contains all inland vessels under the Dutch flag registered by the International Association the Rhine Ships Register (IVR). For each inland vessel, the register indicates, among other things, its ship type, market segment, length, width, load capacity and year of construction. The register was consulted in July 2019. The CEMT class is not indicated in the register. We assigned CEMT class to each vessel based primarily on its width in accordance with the Dutch Guidelines for Waterways 2017 (Rijkswaterstaat, 2017). If the width was unknown, the length and cargo capacity were used.

The active fleet can be defined as inland vessels under the Dutch or a foreign flag that have made one or more trips on the Dutch waterways in a year. For this purpose, we used data from the Network Information System (NIS) of Rijkswaterstaat. Rijkswaterstaat is the Directorate-General for Public Works and Water Management of the Ministry of Infrastructure and Water Management of the Netherlands. The NIS is based on the mandatory notification of inland vessels longer than 110 m, container vessels, liquid bulk vessels and vessels with dangerous goods (Regulation on communication and dimensions of national inland waters, 2018). Vessels that pass a lock are also reported. Since small dry cargo vessel may not be registered, we could only analyse the relative growth of the active dry cargo fleet.

Travel data from the Inland Waterways Analysis System (BIVAS) of

Rijkswaterstaat were used to analyse small inland shipping from the second perspective, namely transport of cargo. A trip is defined as a vessel movement from origin to destination regardless of the vessel's flag with either the origin or the destination being in the Netherlands. Data were available for the period 2014–2018. Two data files were used. The first file contained travel data with (anonymous) information about vessels such as ship type, dimensions, tonnes loaded, type of cargo and loading capacity. In this file, all vessel types were converted to a CEMT class and divided into dry and liquid bulk. The second file contained route statistics such as the number of kilometres travelled. In this dataset, international trips were split into two parts — the part within the Netherlands and the part outside the Netherlands. Only trips with the origin or destination within the Netherlands were included. The two files were merged using a unique trip identification number. Since the coverage of the travel file differed from the route statistics file, data for some vessels were corrected in order to make an accurate comparison over the years (Table 3). Using the two data files, we analysed the individual transport performance of vessels (number of trips, average tonnes transported, average kilometres per trip), transport performance and the average load factor.

Regarding the inland port perspective, the throughput data were obtained from Statistics Netherlands. The throughput data are collected per municipality and include dry bulk, general cargo, liquid bulk and containers. Nevertheless, small vessels with dry cargo often call at inland ports along small waterways. The number of dry cargo ships in classes 0–4 is overrepresented at 67 % (IVR, 2020). Furthermore, inland ports in 257 municipalities are assigned the CEMT class of the waterway along which they are located using the waterway information of Rijkswaterstaat (2019b)

4. Analysis

4.1. Fleet

In terms of the number of ships, small dry cargo ships (class 0–4) represent 72 % of the registered Dutch dry cargo vessels (Table 4). Table 4 also indicates that class 5 ships constitute the largest share in the registered fleet. Class 0 and class 3 ships represent a large proportion of the Dutch registered dry cargo vessels with 21.4 % and 20.6 %, respectively. In terms of loading capacity, the share of small dry cargo ships is considerably lower, namely 36.8 %. With 1,338 ships, class 5 accounts for the largest share of the loading capacity (54.8 %).

Regarding the construction year, it can be noticed that the small registered fleet is significantly older than the ships in classes 5 and 6. The 1960 s were the peak construction period for vessels in classes 1–3, and the peak construction year for class 4 ships was 1972. The peak year of construction for class 5 and 6 ships was 2008.

Table 5 contains data on the active dry cargo fleet in the Netherlands per CEMT class for the years 2007–2018. In this period, the average annual growth of the entire active dry cargo fleet was slightly negative at −1.1 %. The active small dry cargo fleet (classes 0–4) exhibited even more negative growth than the total active dry cargo fleet since it decreased by approximately-one third between 2007 and 2018. The average annual growth in this period was −3.3 %. The development in class 1 was the most negative of all classes with an average growth of −5.7 %; the development was the least negative in class 4 with an average growth of −1.8 %. The share of the active small dry cargo fleet in the total active dry cargo fleet decreased from 69.0 % to 53.5 % between 2007 and 2018. In contrast, the growth of class 5 (45.2 %) and class 6 (13.1 %) vessels in the active dry cargo fleet was remarkable in this period. This is a clear signal of scaling up in the dry cargo shipping sector.

Table 3
Coverage of trips with route information per year.

	2014	2015	2016	2017	2018
Trips with route information	549,017	602,680	600,913	601,430	619,977
Trips without route information	53,020	7,347	5,811	8,981	8,704
Total number of trips	602,037	610,027	606,724	610,411	628,681
Coverage Trips with route information (%)	91.2	98.8	99.0	98.5	98.6

4.2. Transport

The analysis of the trips taken between 2014 and 2018 (Table 6) revealed a slight increase in the number of trips for small dry cargo vessels, the average number of tonnes per loaded trip and the average number of kilometres per loaded trip. For vessels in classes 0–2, the number of trips decreased whereas the average tonnes per trip increased. For vessels in classes 3–6, the average tonnes per trip decreased in the period studied. Moreover, the data in Table 6 indicate that the larger the vessel the higher the average distance per trip.

The transport performance of dry cargo shipping increased by 7.5 % from 32.3 to 34.8 billion tkm between 2014 and 2018 (Table 7). During this period, the share of small dry cargo shipping (class 0–4) remained stable at 10 billion tkm although with a (small) decrease of −3.2 % Furthermore, major differences between shipping classes can be observed. In particular, class 1 and class 2 vessels showed a significant decrease in transport performance of −37 % and –23 % in the period 2014–2018, respectively. Class 5 transport performance increased by 21 % from 13.2 to 15.1 billion tkm. Between 2017 and 2018, a decrease in transport performance was due to the long period of low water levels in 2018 and the consequent limitations on the tonnage of vessels.

The average load factor of small dry cargo vessels (class 0–4) was higher than that of the other vessel types (Fig. 1). Class 3 vessels had a load factor of between 80 % and 85 % in the period 2014–2018. Class 1 and 2 ships had a slightly lower average load factor of between 75 % and 77 %. Class 5 and 6 ships had the lowest average load factor. The average load factor of class 5 ships remained reasonably stable at around 55 % from 2014 to 2018. During the same period, the average load factor of class 6 ships decreased from 48 % to 44 %. As expected, the shrinking active fleet and declining transport performance led to a situation in which the active small vessels were put to good use.

4.3. Inland ports

Table 8 shows that almost 435 million tonnes of cargo were handled in Dutch inland ports in 2018. In 2011, the throughput was 412 million tonnes. The total throughput in inland ports along small waterways increased by 7.5 % in the period 2011–2018, with an average annual growth of 0.8 %.

The increase in throughput in inland ports along small waterways (classes 0–4) was higher than the throughput increase in inland ports along major waterways (classes 5–6). The average annual growth in throughput in inland ports along small waterways (classes 0–4) was 3.2 %. Inland ports along class 2 waterways showed the highest annual average growth (2.5 %). Inland ports along class 5 and 6 waterways had an average annual growth of 1.1 % and 0.6 %, respectively. The growth in throughput in inland ports on small waterways indicates that small dry cargo vessels mainly navigate on small waterways.

4.4. Comparison of different market definitions of small dry cargo shipping

The literature indicates that there are different market definitions of small dry cargo shipping. In the analysis, we observed many differences in performance between different CEMT classes. Table 9 compares the average annual growth figures based on four different market definitions of dry cargo shipping. The table contains the growth figures for the most

Table 4
Registered Dutch dry cargo fleet per CEMT class: number of ships, loading capacity and peak construction year in July 2019.

CEMT class	Number of ships			Loading capacity			Peak construction year
	Absolute frequency	Percentage	Cumulative percentage	Absolute frequency	Percentage	Cumulative percentage	
0	1,153	21.4	21.4	145,427	2.2	2.2	1930
1	316	5.9	27.3	73,674	1.1	3.3	1962
2	555	10.3	37.6	265,898	4.0	7.3	1964
3	1,109	20.6	58.2	946,042	14.1	21.4	1965
4	741	13.8	72.0	1,036,224	15.4	36.8	1972
5	1,338	24.8	96.8	3,674,907	54.8	91.6	2008
6	177	3.3	100.0	568,156	8.4	100.0	2008
Total	5,389	100		6,710,328	100		1964

Source: IVR, adapted by authors.

Table 5
Active dry cargo fleet on Dutch waterways per CEMT class: number of ships in the period 2007–2018.

CEMT class	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total growth 2007–2018 (%)	Average annual growth 2007–2018 (%)
0	346	296	311	368	398	364	326	336	316	277	278	250	−27.7	−2.4
1	651	662	612	602	576	581	522	492	441	349	359	332	−49.0	−5.7
2	715	675	651	666	679	642	600	593	581	538	505	478	−33.1	−3.5
3	1,865	1,737	1,665	1,640	1,598	1,529	1,459	1,407	1,338	1,288	1,290	1,221	−34.5	−3.8
4	1,310	1,241	1,229	1,241	1,277	1,259	1,205	1,152	1,172	1,137	1,118	1,068	−18.5	−1.8
5	1,324	1,401	1,418	1,770	1,993	1,887	1,846	1,937	1,839	1,839	1,946	1,923	45.2	3.8
6	875	885	822	807	1,041	949	928	900	918	911	840	990	13.1	1.7
Total	7,086	6,897	6,708	7,094	7,562	7,211	6,886	6,817	6,605	6,339	6,336	6,262	−11.6	−1.1
0–4	4,887	4,611	4,468	4,517	4,528	4,375	4,112	3,980	3,848	3,589	3,550	3,349	−31.5	−3.3
0–4 (%)	69.0	66.9	66.6	63.7	59.9	60.7	59.7	58.4	58.3	56.6	56.0	53.5		

Source: NIS-RWS.

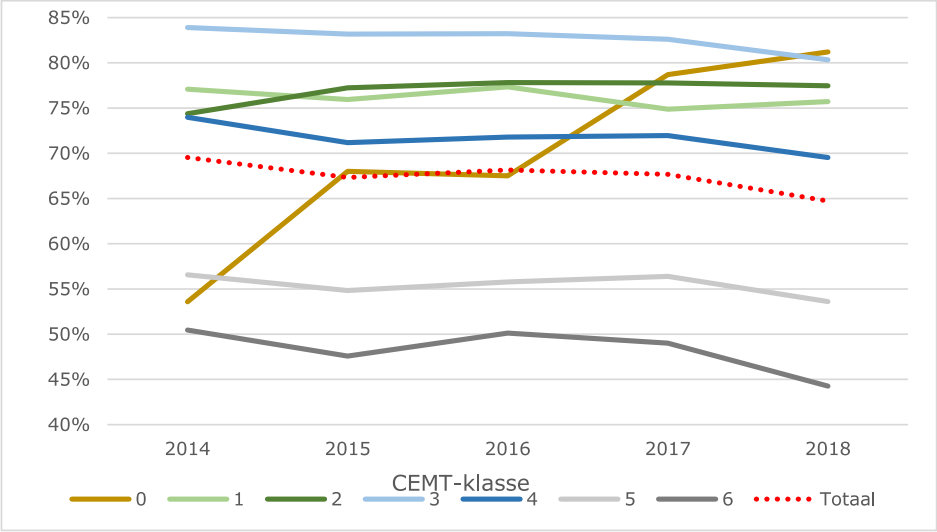
Table 6
Dry cargo shipping trips in the Netherlands per CEMT class in the period 2014–2018: number of trips, average tonnes per trip and average distance per trip.

CEMT class	2014	2015	2016	2017	2018	Average 2014–2018	Total growth 2014–2018 (%)	Average annual growth (%)
Number of trips								
0	2,288	2,764	3,195	1,926	1,800	2,395	−21.3	−2.5
1	4,586	4,091	3,536	3,612	3,384	3,842	−26.2	−7.1
2	34,475	30,341	29,602	27,148	26,424	29,598	−23.4	−6.3
3	79,347	84,489	85,425	82,132	81,563	82,591	2.8	0.8
4	48,167	55,923	56,623	55,697	58,061	54,894	20.5	5.0
5	62,203	77,442	77,777	80,504	88,845	77,354	42.8	9.7
6	15,294	20,697	19,935	19,679	22,326	19,586	46.0	11.0
Total	246,360	275,747	276,093	270,698	282,403		14.6	0.4
Total 0–4	168,863	177,608	178,381	170,515	171,232	173,320	1.4	3.6
Average tonnes per trip								
0	157	203	179	218	215	194	36.4	9.4
1	293	300	304	296	297	298	1.6	0.4
2	438	460	465	464	463	458	5.8	1.4
3	811	808	814	810	788	806	−2.9	−0.7
4	1,186	1,137	1,152	1,161	1,124	1,152	−5.2	−1.3
5	1,751	1,729	1,775	1,789	1,697	1,748	−3.1	−0.7
6	3,931	3,755	3,947	3,875	3,308	3,763	−15.8	−4.0
Avg 0–4	846	860	874	880	862	865	1.9	0.0
Average distance per trip (in kilometres)								
0	66.8	76.3	58.9	72.5	72.1	69.3	8.1	3.5
1	124.0	124.3	136.2	130.3	125.5	128.1	1.2	0.4
2	105.5	112.5	110.3	112.8	112.3	110.7	6.4	1.6
3	120.5	122.5	122.3	122.0	121.1	121.7	0.5	0.1
4	135.5	133.2	137.2	138.2	134.3	135.7	−0.9	−0.2
5	151.9	152.5	157.2	154.8	150.3	153.3	−1.1	−0.2
6	153.7	157.4	155.0	158.3	157.7	156.4	2.6	0.7
Avg 0–4	122.4	124.7	125.9	126.7	124.9	124.9	2.0	0.6

Table 7
Transport performance (in million tonne-kilometres) of dry cargo shipping in the Netherlands per CEMT class in the period 2014–2018.

CEMT class	2014	2015	2016	2017	2018	Total growth 2014–2018 (%)	Average annual growth 2014–2018 (%)
0	4.1	4.2	3.4	4.4	4.1	−0.9	1.2
1	83.6	69.7	63.2	61.6	52.6	−37.1	−10.8
2	873.3	772.2	751.7	707.7	669.1	−23.4	−6.4
3	4,499.1	4,433.1	4,551.8	4,356.3	4,138.3	−8.0	−2.0
4	5,000.5	5,151.2	5,435.4	5,470.5	5,261.1	5.2	1.3
5	13,244.0	14,926.1	15,346.7	16,189.1	16,031.2	21.0	5.0
6	8,427.5	9,266.4	9,391.7	9,326.4	8,484.1	0.7	0.4
Total	32,335.2	34,719.0	35,681.0	36,348.4	34,784.9	7.5 %	1.6
Total 0–4	10,460.5	10,430.3	10,805.5	10,600.4	10,125.2	−3.2	−0.8

Source: RWS-BIVAS, adapted by authors.



Source: RWS-BIVAS.

Fig. 1. Average load factor (in %) of dry cargo shipping in the Netherlands per CEMT class in the period 2014–2018.

Table 8
Throughput per municipality (in million tonnes) with an inland port per CEMT class in the period 2011–2018.

CEMT class	2011	2012	2013	2014	2015	2016	2017	2018	Total growth 2011–2018 (%)	Average annual growth 2011–2018 (%)
0	0.22	0.28	0.31	0.19	0.23	0.27	0.40	0.32	44.3	9.2
1	0.30	0.29	0.42	0.27	0.34	0.28	0.26	0.28	−6.1	2.4
2	6.69	5.70	5.64	7.14	7.39	6.71	8.22	7.40	10.7	2.5
3	5.27	5.60	4.64	4.48	4.81	4.87	4.51	5.41	2.8	1.0
4	25.93	24.58	26.93	28.17	27.12	26.67	27.71	27.85	7.4	1.1
5	106.28	102.46	101.82	107.17	109.79	110.63	107.62	114.30	7.5	1.1
6	267.22	264.42	268.82	277.58	276.43	275.70	278.76	279.20	4.5	0.6
Total	411.91	403.32	408.59	429.42	426.10	425.13	427.48	434.77	5.6	0.8
Total 0–4	38.41	36.44	37.95	40.25	39.88	38.80	41.10	41.27	7.5	3.2

Source: CBS.

narrow definition of dry cargo shipping (classes 0–2), the definition that encompasses classes 0–3, the definition of small dry cargo shipping used in this research (classes 0–4) and the definition including the total dry cargo shipping market (0–6).

The comparisons in Table 9 indicate that the definition of dry cargo shipping has an important influence on the way its performance is assessed. A narrower market definition provides a more negative picture with regard to the active fleet. If the definition of dry cargo shipping includes classes 0–4, the observed average annual growth is −3.3 %. If the dry cargo shipping definitions include classes 0–2 or classes 0–3, there is an observed decrease in growth of 4.0 % and 4.2 %, respectively. Similarly, the number of trips decreases as the definitions become narrower. Moreover, narrower definitions provide a more negative picture of transport performance. In contrast, when dry cargo shipping market is considered as a whole (classes 0–6), one can observe a positive average growth of 1.6 %.

A narrower definition of the dry cargo shipping market leads to a more positive picture regarding the average weight transported per trip and the average distance per trip. This also applies to the load factor. If the market definitions include classes 0–3 and classes 0–4, one can observe an average increase of the load factor from 2014 to 2018 by 9.5 % and 11 %, respectively. If only classes 0–2 are included in the definition, this increase is 12 %. Regarding inland ports, if dry cargo shipping is defined as encompassing classes 0–4, then one can observe a 3.2

Table 9
Comparison of the average annual growth of different indicators based on different market definitions of dry cargo shipping.

Perspective	Indicator	CEMT class			
		0–2	0–3	0–4	0–6
Fleet	Number of vessels in the active dry cargo fleet (2007–2018)	−4.2	−4.0	−3.3	−1.1
Transport	Number of trips (2014–2018)	−2.6	−1.6	0.4	3.6
	Average kilometres per trip (2014–2018)	1.2	0.9	0.6	0.5
	Average tonnes per trip (2014–2018)	2.4	1.0	0.0	1.9
	Transport performance of ships in tonne-kilometres (2014–2018)	−6.7	−2.8	−0.8	1.6
	Load factor (2014–2018)	12.1	11.0	9.5	3.4
Inland ports	Throughput in tonnes at inland ports along small waterways (2011–2018)	4.7	3.8	3.2	0.8

% increase in cargo throughput in the period 2011–2018. If the market definition is narrowed down to classes 0–2, an increase of 4.7 % can be observed. In conclusion, the market definition has an impact on how the performance of small dry cargo shipping is assessed. We believe that this is an important reason why there are different perceptions of small dry cargo shipping.

5. Conclusion

Having examined various academic studies on small dry cargo shipping, we found that only few studies focussed specifically on small dry cargo shipping. The societal and political discussion in the Netherlands about benefits and disadvantages of small dry cargo shipping has been going on for almost two decades. Recurring themes in this debate have been the declining fleet, the lack of entrepreneurial spirit among skippers and the sustainability of small inland shipping, which is closely related to the age of small ships. Despite the long-lasting debate on small dry cargo shipping in the Netherlands, with a variety of opinions on the future of the sector and possible government intervention, there has been no analysis of the functioning of this sector. We argue that the sector is operating below the radar because it is unnoticed in previous studies and because our performance analysis on fleet, cargo transport and inland ports showed besides negative certainly also positive developments.

The analysis has revealed that small dry cargo vessels account for 72 % of the registered dry cargo fleet sailing under the Dutch flag and for 40 % of the Dutch dry cargo fleet's total cargo capacity. The size of the active small dry cargo fleet decreased by approximately-one third between 2007 and 2018.

In analysing the trips taken between 2014 and 2018, we observed a slight increase in the number of trips, the average number of tonnes per loaded trip, and the average number of kilometres per loaded trip. During the same period (2014–2018), the transport performance of small dry cargo shipping decreased by 3.2 % while that of the entire dry cargo shipping sector increased by 7.5 %. Despite the declining transport performance and the shrinking active fleet, small dry cargo vessels had an above-average load factor. Another positive development was a 13.2 % increase in cargo throughput at inland ports situated along small waterways from 2011 to 2018, which was higher than the total throughput increase for all inland waterways (7.5 %).

We argue that a better understanding of the current knowledge base and performance of a transport sector is an important prerequisite for discussions about and with the sector and for formulating policies. In the debate and studies in our case recurring theme is for example the shrinking fleet and possible policy interventions to preserve the small ship. This study is helpful to start the conversation with the sector about the shrinking fleet. The analysis shows that the active fleet is indeed declining but that there are important differences in the development per ship size. The development in class 1 was the most negative (average growth of −5.7 %); the development in class 4 was less negative (average growth of −1.8 %). The use of policy instruments for ship preservation may therefore differ from one class to another. Whether actual government intervention is necessary and which policy instruments should be used was not part of this research. It depends on whether there is a market failure. In addition, opinions about the functioning small dry cargo shipping cannot be grouped together. This research showed that varying market definitions of small dry cargo shipping exist. How small dry cargo shipping is defined has a major impact on the assessment of its development. This research study defines it as pertaining to vessels with a maximum length of 85 m and maximum load capacity of 1,500 t. The narrower the market definition of small dry cargo shipping the more negative the resulting assessment of the active dry cargo fleet, number of trips and transport performance. However, a narrower definition results in a more positive assessment of the average number of kilometres per loaded trip, average tonnes per loaded trip, load factor and cargo throughput at inland waterway ports. The fact that a market definition can influence the assessment of the sector could be an important reason behind different positive and negative views of small dry cargo shipping among skippers, shippers and policy makers.

This paper included indicators on the fleet, cargo transport and inland ports in the analysis. The choice of the indicators used in the analysis of the Dutch small dry cargo shipping sector is mainly steered by data availability. And although the indicators analysed in this paper are closely to indicators in other existing monitors for (maritime) freight transport, we see the following future research directions that will broaden and improve the analysis. First, the financial perspective of the skippers and their financial position has not been elaborated on. It could provide a more complete picture of the small dry cargo sector. A good starting point is Van Hassel's study (2015) on the financial position of shippers for the period 2008–2013, which indicates that the solvability of owners of small dry cargo ships is good. More recent insights into the financial position would provide an even more complete picture of the small dry cargo sector. Second, more detailed data on the type of goods would make the analysis on trips and throughput more accurate. Thirdly, it would be interesting to see the European perspective on how the Dutch small-dry cargo fleet and transport performance is performing. For this purpose, the data from the Central Commission for Navigation on the Rhine and Eurostat were not detailed enough.

This research primarily provides insight into the current knowledge base and performance of small dry cargo shipping in the sector. It is a study that is about the sector rather than discussed with the sector. It makes no statements about future developments. Relevant questions on the future: What is the influence of new logistic-technological concepts? How do skippers view the ageing workforce and the increasing number of foreign employees? What are the future plans and motives of young entrepreneurs in small-scale dry cargo shipping? We see the present and new generation of skippers as an important source for the future of small dry cargo shipping. In answering this type of question, we can take an example from the study by Hubens (2004). In this study, a large survey was carried out among skippers. The study of Hubens (2004) provides clear profiles of skippers and answers questions on many social and economic aspects of entrepreneurship in inland shipping.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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