

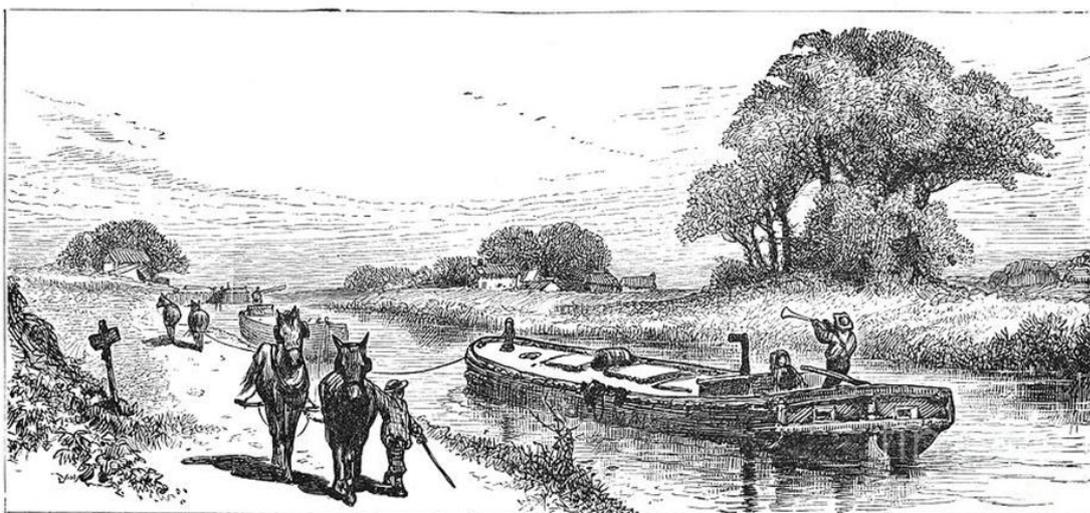


Inland Navigation & Container Terminal Efficiency

This paper addresses the challenges and opportunities container transportation logistics will encounter over the coming 2-3 years specifically in the context of development of the Ports of Rotterdam and Antwerp with current and upcoming Terminal facilities, Delta 1 and Delta 2 and expected growth in the ARA Range. The move in Antwerp by MSC to Deurganckdock will also add new challenges. Other elements contributing to changes in the Intermodal Scene in Europe are the upcoming P3 concept (short term) and the Maasvlakte long term Modal Split objective Road 35%, Rail 20% and Inland Navigation 45% by 2035. The consolidation of Inland Navigation Operators in the Rhine-Ruhr area and the financial impact of the DB Rail pricing policies will likewise create a shift of ownership and decision power process in the European Intermodal scene.

1. Purpose & Objectives

- Analyse the Central European Inland Navigation scene in the ARA (Amsterdam – Rotterdam – Antwerp) Range and North-West Germany, North France, Belgium and The Netherlands
- Identify the weaknesses of current Inland Navigation operations and evaluate the role and responsibility of the respective stakeholders
- Recommend possible solutions improving Inland Navigation efficiency and its sustainable development
- Formulate suggestions and ideas to be explored for further actions and engagement of all stakeholders



Grain-Boat on the Erie Canal.



2. Generic overview of Inland Navigation in North-Central Europe

While a large part of goods transported in Europe is still moving by Road, we notice that specifically in The Netherlands, Belgium and to some extent Germany the contribution of Barge Transportation is important. Yet the inland waterway network in North-Central Europe has sufficient open capacity to allow considerable traffic growth over inland waterways (Table 1). (*Wegvervoer = Road, Binnenvaart = Barge, Spoor = Rail*)

Modal split per EU-land (vervoersprestatie), 2009

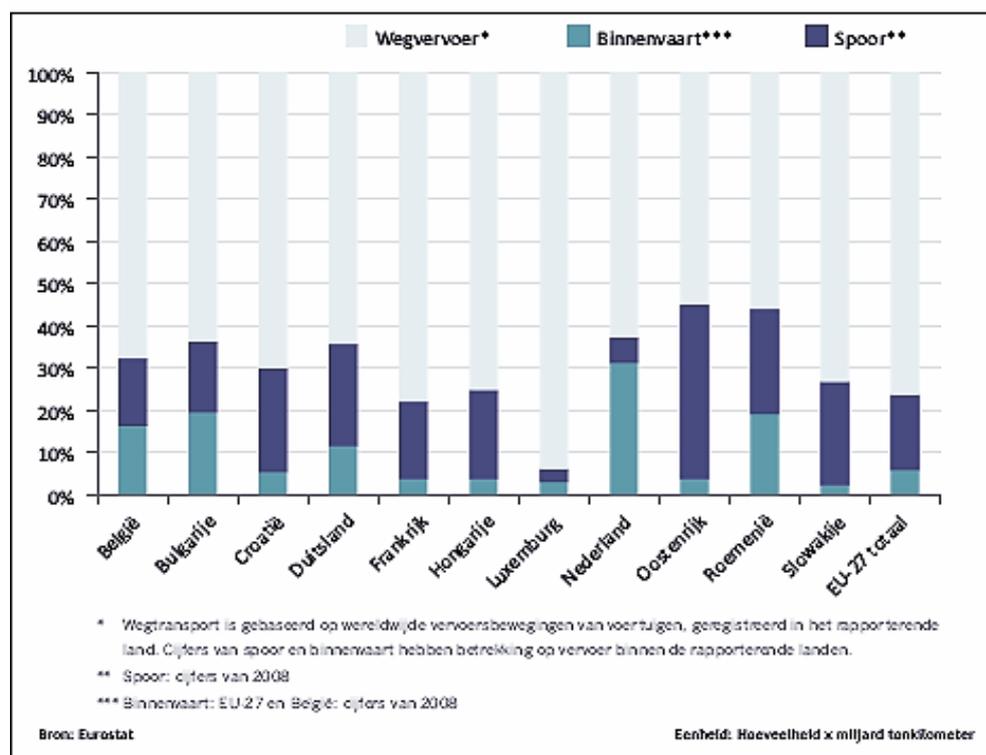


Table 1 – Source Eurostat – 2008





The modal split in Container Transportation to /from the ports in the Hamburg – Le Havre range is showing the significance of the ports of Antwerp and Rotterdam with respect to Barge Transportation (Binnenvaart), while Bremerhaven, Hamburg and Zeebrugge are more profiled as Railports (Table 2). (From left to right Wegvervoer = Road, Binnenvaart = Barge, Spoorvervoer = Rail)

Modal Split container achterlandvervoer EU-zeehavens

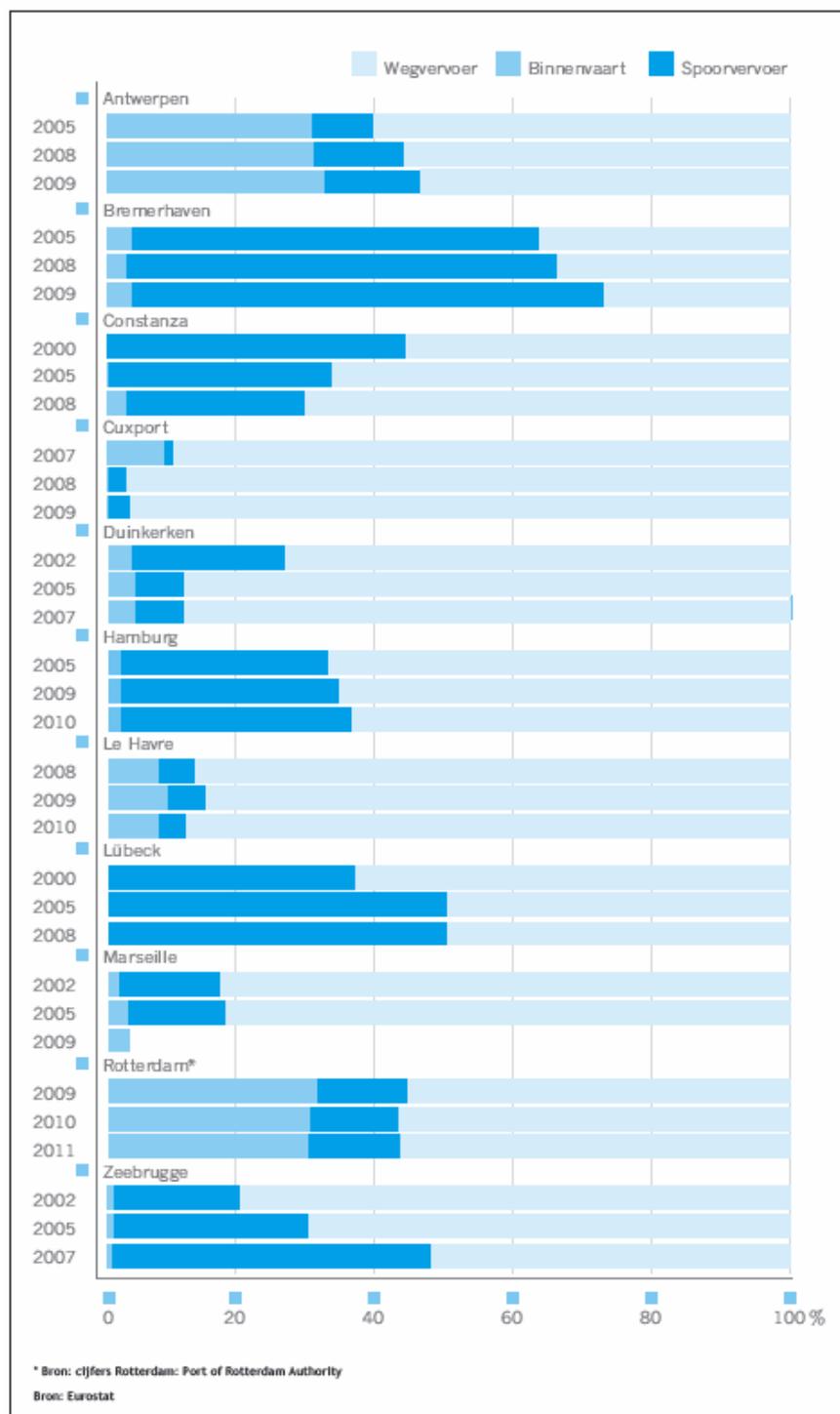


Table 2 – Source Eurostat



Table 3 shows the modal split handled at Inland Container Terminals in Germany, Belgium and Switzerland. Whereas these Inland Terminals are mainly served through Antwerp and Rotterdam, for France Lyon is served via Marseille - Fos s/Mer and Paris via Le Havre. For Germany, Barge represents 1,297,629 TEU handled over the listed Terminals.

(From left to right Wegvervoer = Road, Binnenvaart = Barge, Spoorvervoer = Rail)

Modal Split Containerterminals in het achterland, 2011

	Wegvervoer		Binnenvaart		Spoorvervoer		Totaal
	TEU		TEU		TEU		
Duitsland							
Aschaffenburg	19.391	53,1%	7.295	20,0%	9.836	26,9%	36.522
Berlin	17.585	18,2%	63	0,1%	78.867	81,7%	96.515
Braunschweig	10.169	16,3%	41.394	66,3%	10.873	17,4%	62.436
Duisburg	1.199.000	47,9%	466.000	18,6%	836.00	33,4%	2.501.000
Emmerich	0	0,0%	97.092	90,5%	10.225	9,5%	107.317
Frankfurt	0	0,0%	28.495	42,3%	38.927	57,7%	67.422
Halle/Saale	21.389	29,8%	0	0,0%	50.287	70,2%	71.676
Hannover	0	0,0%	32.347	54,2%	27.333	45,8%	59.680
Karlsruhe	30.210	59,0%	20.991	41,0%	0	0,0%	51.201
Kehl	48.537	62,6%	27.157	35,0%	1.804	2,3%	77.498
Koblenz ¹	25.956	31,9%	54.148	66,6%	1.148	1,4%	81.252
Krefeld ¹	17.568	63,3%	9.897	35,7%	267	1,0%	27.732
Ludwigshafen	onb.	onb.	72.491	93,0%	5.450	7,0%	77.941
Mannheim	onb.	onb.	99.088	56,5%	76.280	43,5%	175.368
Minden ²	29.474	66,4%	14.773	33,3%	159	0,4%	44.406
Neuss-Düsseldorf	365.609	48,3%	158.537	20,9%	233.567	30,8%	757.713
Nürnberg	471.944	62,3%	0	0,0%	285.379	37,7%	757.323
Regensburg/Passau	92.536	50,0%	0	0,0%	92.536	50,0%	185.072
Stuttgart	onb.	onb.	22.207	27,0%	59.934	73,0%	82.141
Weil am Rhein	5.058	16,0%	25.143	79,3%	1.494	4,7%	31.695
Wörth ²	onb.	onb.	120.511	100,0%	0	0,0%	120.511
Zwitserland							
Basel	onb.	onb.	85.287	100,0%	onb.	onb.	85.287
België							
Brussel ³	413	2,3%	17.774	97,7%	0	0,0%	18.187
Meerhout (WTC) ³	11.500	4,8%	225.000	93,8%	3.500	1,5%	240.000
Luik	0	0,0%	28.982	100,0%	0	0,0%	28.982
Frankrijk							
Lille	24.693	31,5%	53.598	68,5%	0	0,0%	78.291
Lyon Terminal ³	77.815	50,0%	56.840	36,5%	20.976	13,5%	155.631
Mulhouse Ottmarsheim	61.453	42,5%	49.789	34,4%	33.375	23,1%	144.617
Paris Terminal SA ³	224.847	65,9%	102.876	30,2%	13.281	3,9%	341.004
Strasbourg	215.981	56,1%	103.904	27,0%	65.356	17,0%	385.241
Oostenrijk							
Enns	136.640	49,3%	402	0,1%	139.981	50,5%	277.023
Krems	32.018 ⁴	onb.	536	1,6%	32.018 ⁴	onb.	32.554
Wien ²	318.870 ⁴	onb.	120	0,0%	318.870 ⁴	onb.	318.990

¹Cijfers van 2009
²Cijfers van 2010
³Cijfers wegvervoer en spoorvervoer zijn gezamenlijk weergegeven
Bron: Schifffahrt, Hafen, Bahn und Technik en HWB

Totale overslaghoeveelheden van andere belangrijke containerterminals (modal split onbekend):
* Duitsland: Bonn - 182.985 TEU, Köln - 514.183 TEU, Mainz - 107.896 TEU
* Nederland: Oosterhout - 160.000, Den Bosch - 120.000 TEU, Born - 125.000, Venray (Wassum) - 95.000, Hengelo - 90.000, Nijmegen - 85.000, Utrecht - 70.000, Zaandam - 45.000, Meppel - 37.000

Table 3 – Source Schiffarth, Hafen, Bahn und Technik 2009 - 2010

Nice to know; Meerhout was created in 1995 on the assumption of handling 25,000 TEU. Today, 20 years later, WTC Meerhout is handling 225,000 TEU by Barge. Assuming a steady growth of 5% per Year over 20 years would produce 65,000 TEU. Reality exceeds



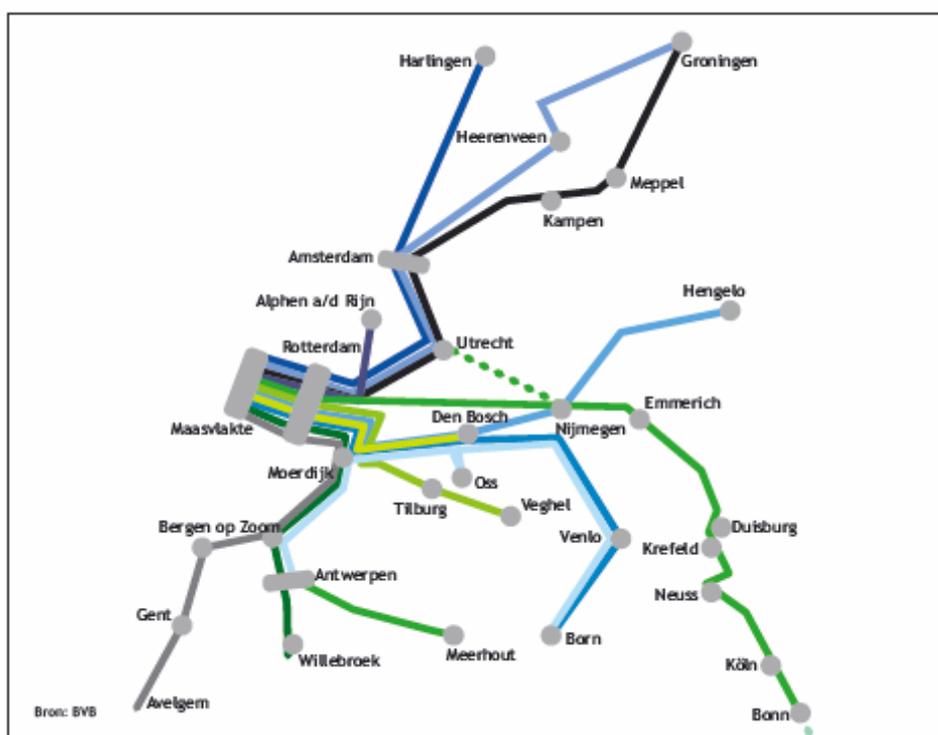
by far expectations. Nike's European Logistics Distribution Centre receives 98% of its goods by Barge over Meerhout.

Several Inland Container Terminals in the Netherlands (Table 4) are served over inland waterways. While most can only be reached by **CEMT IV** en **Va** class vessels, they still handle over 850,000 TEU / Year. Their importance is increasing as both service and economic break-even points move closer to the main ports of Rotterdam and Antwerp. While Transit time becomes a less critical factor in the main trades (slow-steaming, VSA's and Alliances such as New World Alliance, Grand Alliance, G6 and P3) providing higher frequencies, the need for fast land transportation becomes less relevant. Road congestion in the ARA range is likewise contributing to increased Barge and Rail transportation. Mileage based Road Taxes for Trucks in Germany, The Netherlands and Belgium will further contribute to decongesting Road Transportation encourage maximum usage of Barge and Rail modes.

Belangrijke terminals voor containeroverslag, 2011 (TEU)	
Oosterhout	160.000
Born	125.000
Den Bosch	120.000
Venray (Wanssum)	95.000
Hengelo	90.000
Nijmegen	85.000
Utrecht	70.000
Zaanstad	45.000
Meppel	37.000

Table 4 – Source Port of Rotterdam

Mogelijkheden met terminalverbindingen voor de containerbinnenvaart





3. Inland Navigation Vessels – Sizes and Capacity in Europe

CEMT (Conference of European Ministers of Transport) approved in 1992 a classification for Inland Navigation Vessels (Table 5).

Klasse-indeling Europese vaarwegen volgens CEMT

Klasse	Type motorschip	Tonnage (ton)	Samenstelling duwstel	Tonnage (m)	Lengte (m)	Breedte (m)	Diepgang (m)	Hoogte (m)
0	Recreatievaart	< 250	-	-	-	-	-	-
I	Spits	250	-	-	38,5	5,05	1,8	4
		400					2,2	
II	Kempenaar	400	-	-	50	6,6	2,5	4,0
		650					5,0	
III	Dortm. Eemskanaal schip	650	-	1.250	67	8,2	2,5	4,0
		1.000		1.450				80
IV	Rijn Rijnkanaal schip	1.000	-	1.600	80	9,5	2,5	5,25 / 7
		1.500		3.000				
Va	Groot Rijnschip	1.500	-	3.200	95	11,4	2,5	5,25 / 7
		3.000		6.000				
Vb	Tweebais duwstel	-	-	3.200	172	11,4	2,5	9,1
		-		6.000				
Via	Tweebais duwstel	-	-	-	-	-	-	-
Vib	Vierbais duwstel	-	-	6.400	185	22,8	2,5	7,1
		-		12.000				195
Vic	Zesbais duwstel	-	-	9.600	270	22,8	2,5	9,1
		-		18.000				
Vic	Zesbais duwstel	-	-	9.600	193	33	2,5	9,1
		-		18.000				

Bron: CEMT Standaardafmetingen duwbak: 76,5 m x 11,40 m

omvangte vaarwegen per land naar CEMT klasse in Rijn-, oost-west- en noord-zuid-corridor

Land :	I	II	III	IV	V	VI	VII	Totaal
België	533	484	127	6.936	792	591		9.463
Frankrijk	6.692	580	149	194	2.891	200	196	10.902
Duitsland	1.012	395	388	2.989	4.396	3.292		12.472
Nederland	240	1.567	306	1.197	1.581	1.337		6.228
Luxemburg					37			37
Oostenrijk						360		360
Zwitserland					17	5		22
Polen	110	1.761	1.905	275		151		4.202

Bron: NEA Eenheid: Kilometers

Table 5 – Source CEMT



Below overview of CEMT Barge Classes and their container intake capacity shows the level of opportunity the usage of Barges can offer in decongesting roads and their ability to transport containers over inland waterways (Table 6).

While Class III is best suited to move containers on the canals and rivers with limited capacity i.e. mainly France, South-East Belgium and North-East Holland, the Class Va and Vb have a larger geographical scope. Class Vb ships are very effective and cost efficient as they are modern tonnage (most build after 2005) and have the greatest intake capacity (250 x 40ft containers). Class Vb ships are limited to the Amsterdam – Rotterdam – Antwerp Range (ARA) and the Lower-Rhine covering the Rhine-Ruhr area up to Bonn.

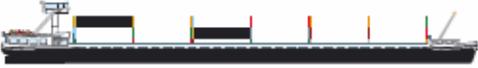
III	 Containerschip Kempenaarsklasse Lengte 63 meter - breedte 7 meter - diepgang 2,50 meter - laadvermogen 32 TEU	 16 x
Va	 Standaard containerschip Lengte 110 meter - breedte 11,40 meter - diepgang 3,00 meter - laadvermogen 200 TEU	 100 x
Vb	 Groot containerschip Lengte 135 meter - breedte 17 meter - diepgang 3,50 meter - laadvermogen 500 TEU	 250 x

Table 6

The first part of Table 5 shows the size of ships per CEMT class operating in European Inland Waterways. (example – Class Va is a large Rhine vessel with an LOA / Beam and Draft of 110 x 11.40 x 2.8 Mtr and an intake capacity of maximum 6,000 Mts and an air draft of max. 7 Mtr). The second part shows per country the length in kilometre of navigable inland waterways per CEMT class.

Here we learn that Central Europe's inland river and canal capacity is diverse and in overall and average terms sufficient to meet demand and growth for the coming 10-15 years. However the limitations on its efficient usage are to be found in the carrying capacity of the canals infrastructure i.e. LOA, beam, keel draft and air draft and size of locks.

The fleet of inland barges in the EU is reflecting this diversity and its carrying limitations.

We see in France still a large amount of Class I barges – the so called Spits Type – with an intake of max. 400 Mts or 8 TEU and a size fit for the French Canal infrastructure dating from pre-napoleon times. Only on the Seine and Rhone rivers (Le Havre - Paris and Marseille - Lyon) will vessels of Class V be able to operate. At the same time we know that the average age of the French Barge fleet is old resulting in pricing based on vessels at scrap value + fuel cost.

Where river and canal capacity allow for larger barges – Netherlands, Belgium and Germany – we see that the fleet size and the size per CEMT Class is considerably bigger. Specifically in the Class V and VI are German and Netherlands flags well represented. The fleet in Belgium is large in the class IV as Belgium has a tradition of good domestic canal infrastructure supporting the 20th century Industrial developments in the South. Unfortunately is the capacity of Belgium's main waterways limited by air draft limits.



The Belgian Government is undertaking a programme to lift the bridges over a.o. the Albert Canal connecting Limburg and Liege industrial areas with the ports of Antwerp and Rotterdam.

Feiten binnenvaart, 2010/2011

Nederland	Noordwest-Europa
7.000 schepen (Nederlandse vlag)	13.500 schepen
8,8 miljoen ton laadvermogen	15,2 miljoen ton laadvermogen
35% vervoersaandeel o.b.v. tonnage t.o.v. weg en spoor	6,5% aandeel o.b.v. tonkilometers t.o.v. weg en spoor
In 2011: 344 miljoen ton vervoerd	521 miljoen ton EU27 in 2011
Over Nederlands grondgebied in 2011:	Over EU-grondgebied in 2011:
- 4,5 miljoen TEU	- 5,7 miljoen TEU
- 611 miljoen TEU-km	- 1.360 miljoen TEU-km
Binnenvaart vervoert 2,4 miljoen TEU vanaf/naar Rotterdam in 2011	
13.250 Arbeidsplaatsen binnenvaart:	
- vrachtvaart: 7.620	
- tankvaart: 1.260	
- sleep-duwvaart: 1.480	
- personenvervoer: 2.880	
Omzet binnenvaart: 1,52 miljard euro	
Aantal bedrijven: 3.720	

Bronnen: CBS, Eurostat, IVR, ZBBD, VNF, Stichting Nederland Maritiem Land

Table 7 – Source CBS

The CEMT classification needs updating as over the past 10 years several barge owners invested in new tonnage (see further in Table 7). Specifically in the Netherlands – Dutch Flag – the barge fleet represent in number of ships abt. 30% of the North-West European capacity and 31% of the million Ton/Km transported. In terms of TEU is the Dutch fleet accountable for moving 44% where obviously Rotterdam is the pivot port.

4. Inland Navigation & Intermodal Operations – Stakeholders

Stakeholders in Inland Navigation are very diverse and have great difficulties in finding grounds for cooperation in support to sustainable and cost efficient Barge Operations.

A. Barge Owners

As could be seen in Table 7, The Netherlands have abt. 7,000 barges owned by 3,720 companies. This ratio owners/companies is not different in Belgium or France. Within the Barge Owners we find single barge owners with relative small and old tonnage on the one hand (mainly Belgium and France) while in The Netherlands barge owners have banked on their mercantile DNA by developing and building new and innovative ships. Many owners invested considerably on the basis of 2004-2007 business plans where growth prospects in containerisation reached into the sky @ 137%.



The events in Global Trade in 2008-2009 pulled our feet back on the ground – or in the case of Barge Owners their heads under the waterline (Table 8 –Container Transportation Development) .

Country Name	TEU 2004	TEU 2007	TEU 2010
Belgium	7,279,638	10,257,511	10,984,824
Netherlands	8,482,190	11,290,260	11,345,167
Grand Total	15,761,828	21,547,771	22,329,991
		137%	104%

Table 8 – Source Worldbank

Most Barge Owners have no direct relation with Cargo Owners or Cargo Controlling parties.

B. Brokers

The Container Inland Barge Transportation market is to a large extent dominated by Brokers. Only few of the Container Shipping companies have single handed sufficient volume to take full ownership of their Inland Transportation Operations.

Brokers have the ability to add value to the process by consolidating the volumes of the respective shipping lines big and small and cargo owners. They are able to optimise capacity utilisation, service offering, frequency and offer a level of price stability. On the other hand are Brokers responsible for the so called “milkman” services meaning that they are the main contributors to the Terminals operational inefficiencies and related unjustified cost.

Their average contribution margin is estimated around 20%. While Barge owners receive for a Rotterdam / Antwerp move a rate of 18.- Euro/TEU we see that the same TEU is sold in the market for 22.- to 24.- Euro. The overall profitability for the Broker is found in the customer mix where small customers pay full price while customers controlling considerable volumes pay a lower rate.

When Supply and Demand shift we see that it only impacts the freight rates and charter fees for the Barge Owners while Brokers retain their fixed contribution margin of 4 to 6 euro per TEU. This pushed charter income for Barge Owners down with 30% over the past 5 years.

C. German Rhine – Ruhr Terminal Operators

Many inland Terminal operators along the Rhine are also offering barge services to the North Sea ports of Antwerp and Rotterdam. They have over time managed to extend their customer base by offering integrated logistics services to German exporters and importers.

Most of these cargo owners are large players in the Car Manufacturing industry (Daimler-Benz, GM, Ford, Audi, VW etc...), Chemical Industry (Bayer, BASF, Monsanto, Degussa etc...) and Large Logistics Service providers (Rhenus, Kuhne – Nagel, Panalpina etc...). Further are most of these Inland Terminals in hands of only few operators (Contargo, Danser, Haeger & Schmidt, Frankenbach, RRT Imperial etc...).



Through maximised control over the Inland Terminals and the Transport Chain – both Barge and Rail - and acting on behalf of the large cargo owners are these Operators de facto manipulating the market. This is done by adding to inefficiencies for 3rd party barge operators through extended lay-time and berthing window manipulation at their Terminals and through non-transparent tariff constructions.

The Rhine-Ruhr Operators engage with Barge Owners through medium and long-term charter contracts at reasonable rates. The Contribution Margin is weighed over the total chain i.e. Handlings, Storage, Transport, Value Added and Forwarding & Logistic Services etc... and delivers good EBITDA's. They do however also contribute to the "milkman" phenomena by also contributing to the Terminals operational inefficiencies and related unjustified cost.

D. Seaport Container Terminal Operators

Most Container Terminal Operators in Seaports are reluctant to extend their service offerings with Intermodal products. The Extended Gate Concept is on the table for many years yet Terminal Operators do not explore the opportunities. The rationale for this policy is not always clear. Fear for entering into a conflict of interest with their customers – the Shipping Lines – is a frequently used argument. Yet, towards 2035 they will have an obligation to move 20% of their handled containers by Rail and 45% by Barge. Most of the Top-10 Shipping Lines have engaged into partnerships with a Terminal Operator in one or more ports in the Le Havre – Hamburg Range. A consolidation of volumes and quest for synergies is a must and needs to be initiated now – not in December 2034.

The development of Maasvlakte II in Rotterdam is contributing to the logistics complexity where some operators (APM terminals, ECT) have two or more separated sites of operations. Likewise we see in Antwerp the Leftbank Deurganckdock (Antwerp Gateway by DP World, PSA and soon MSC) facilities separated by the Scheldt River and locks from the Rightbank Terminals (PSA 420, MSC at Delwaidedock).

E. Container Shipping Lines

Over the past 30-40 years shipping lines have engaged in Intermodal Operations under the protection of Conference Inland Tariffs.

Soon after the abolishment of Conference Inland Tariffs they disengaged on the argument that Intermodal Service Offerings were not their core-business acknowledging their inability to offer cost efficient Inland products.

Occasionally they re-engaged as the markets and customers where demanding party for STD0 services while volumes and economy of scale justified such engagement.

Fact is that only few Container Shipping Companies have the volumes and economy of scale allowing for a cost efficient Intermodal product and service offering. In their drive to outsource non-core activities they have also handed over cargo control to 3rd party operators.

Their inability to set-up effective service organisations and provide ancillary services pushed often lucrative cargo flows out of their bottom line. An example is the abortion of LCL acceptance where NVOCC's and Consolidators recovered these very lucrative activities leaving the Shipping Lines at the very best with FAK rated shipments.



Few Container Shipping Companies have integrated Inland Activities into their Customer Service processes and service offerings while considering such services more as a hassle than a product adding value to their product portfolio. The result is loss over cargo control and subjecting their activities to unpredictable global market fluctuations only.

Even recent consolidation initiatives such as New World Alliance, Grand Alliance, G6 and P3 seem unable to take the next step of moving forward by developing also sustainable transport solutions beyond the freeboard of the vessels. While finding their way in coalitions on the seas we see that they exclude the Landside Operations from such alliances leaving it with the individual Shipping Lines at the very best and in most cases with Cargo Owners, Brokers, Forwarders, Logistic Service Providers and Intermodal Operators to complete cargo journeys.

The Container Liner Operators consider the phenomena of "Port Equalisation" in the Antwerp / Rotterdam B/L concept as a hassle adding Cost, Complexity and Risk to the Transportation Process. Attempts to abolish this have failed as cargo owners reject accountability referring to the Shipping Lines making the choice of entry / exit port. The new P3 schedules will change this by offering more direct calls evenly distributed over Antwerp and Rotterdam reducing the need for Antwerp/Rotterdam Port Equalisation traffic.

Last but not least; by only selectively engaging in Intermodal Operations are shipping lines not suffering from any negative economic or efficiency impact leaving the cost of non-conformance with all other stakeholders. Some of these stakeholders have ceased this as an opportunity and turned it around into lucrative business.

5. Rotterdam - Barge Operations @ Maasvlakte Container Terminals

Maasvlakte will handle in 2035 an estimated 15 million TEU (4.6 million in 2011). The concession agreements between the 7 main Terminal Operators at Maasvlakte and the Port of Rotterdam contain the obligation to handle a modal split where Road received and delivered containers is to be reduced from the current 48% down to 35% only. The balance will have to move by Rail and Inland Navigation Barges. (Table 9)

Whereas 1.8 million TEU were moved by barge in 2011, by 2035 the Terminal Operators will have to handle 45% of their throughput or an estimated 7 million TEU on Barges.





Table 9 – Source PoRA

Visualizing current (2010 data used however 2010-2013 growth marginal) flows of Maasvlakte movements we see already today figures causing concern although no surprise (Table 11).

A recent study by the Rotterdam Port Authority revealed that the 7 container terminal operators handle barges with average 41 moves per call only. (see Table 10)

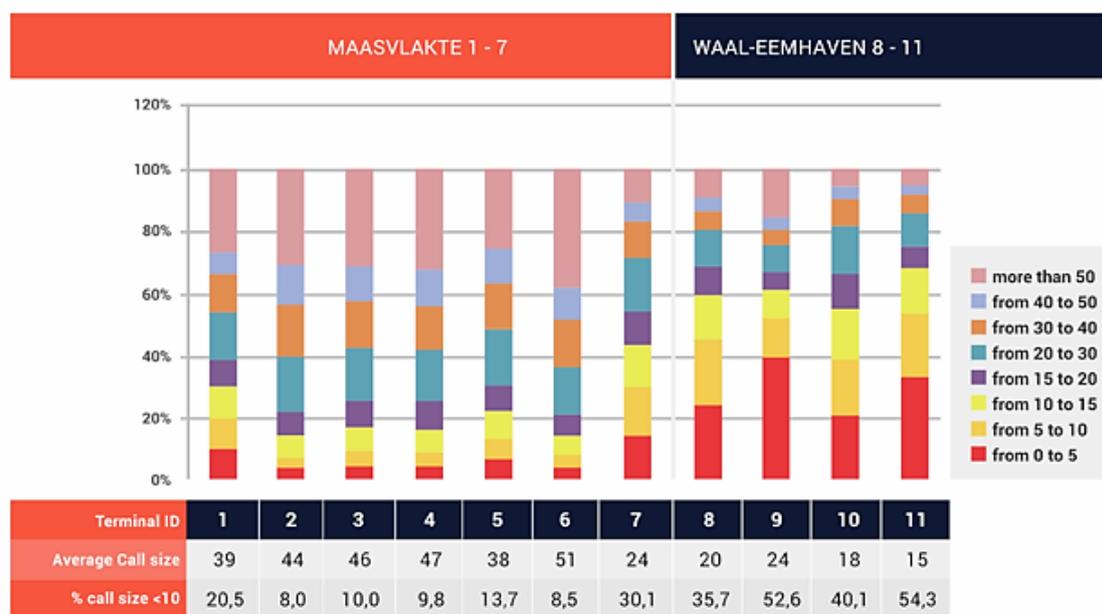


Table 10 – Source PoRA

Out of the 11 Terminals handling barges in the Port of Rotterdam we see that only 1 terminal is receiving barges with average more than 50 moves per call. On 6 out of 11 terminals we learn that the number of barges with less than 10 moves exceeds over 20% of the barges handled. On facility 9 and 11 we see that 1 out of 2 barges operate less than 10 moves.

When relaying the volumes in a 24/7 scenario assuming all 7 facilities would exchange containers around the clock, 5 days a week at 16 Hours/day we see over 251 trucks moving in/out Maasvlakte every hour. Handling 21 trains of 80 TEU each is likely less of a problem however looking at the handling of barges we see that on basis of an average move count of 41 moves/barge the 7 terminals will have to handle 81 barges in a 24/7 scenario (Table 11).

Handlings (20/40 Ratio - 35/65)	TEU/ Day 2010	20ft	40ft	Moves/ Day 2010	Transport Units / Day
Road (trucks to be handled)	6,027	2,110	1,959	4,068	4,068
Rail (Trains to be processed @ 80 TEU)	1,644	575	534	1,110	21
Barge (Barges to be handled @ 400 TEU)	4,932	1,726	1,603	3,329	12
Barge (Barges to be handled @ 41 moves)	4,932	1,726	1,603	3,329	81

Table 11 – Source PoRA



Reducing the portion of Road transported containers from current 48% to 35% by 2035 will still add another 8,000 TEU/day on the roads. Over 100 trains will need to be formed every day while the 9 Maasvlakte Terminals will need to handle over 19,000 TEU every day – 24/7. (see Table 12)

Throughput	2010 / TEU / year	2010 / TEU / day	2035 / TEU / year	2035 / TEU / day
Road	2,200,000	6,027	5,000,000	13,698.63
Rail	600,000	1,644	3,000,000	8,219.18
Barge	1,800,000	4,932	7,000,000	19,178.08

Table 12 – Source PoRA

Over 9 terminals, the number of trucks moving in/out per hour in a 16/5 scenario will be 578 per hour. While this is manageable it appears less evident for Rail as here average 103 trains per day will need to be handled by the 9 Terminals or at least 4 trains are to be processes every hour.

While the current volumes require the Terminals to handle 81 barges at average 41 moves/Barge, in 2035 the Barge handling capacity of the 9 terminals will have to be 4 times more compared to today (from 4,932 to 19,178 TEU/Day) (Table 13).

Handlings (20/40 Ratio - 35/65)	TEU/ Day 2035	20ft	40ft	Moves/ Day 2035	Transport Units / Day
Road (trucks to be handled)	13,699	4,795	4,452	9,247	9,247
Rail (Trains to be processed @ 80 TEU)	8,219	2,877	2,671	5,548	103
Barge (Barges to be handled @ 400 TEU)	19,178	6,712	6,233	12,945	48
Barge (Barges to be handled @ 41 moves)	19,178	6,712	6,233	12,945	316

Table 13 – Source PoRA

In 2035 - To host 316 barges every day with an average berth stay of 2 hours handling 41 moves on Barges with an LOA of 110 meter (safe mooring space @ 130 meter) one would have to allocate 3,400 Mtrs quay length permanently to handle exclusively barges.

The future facilities – including dedicated barge berths – offer 10,700 meter berthing space resulting that 32% of the total Rotterdam Container Terminals Berth capacity will be needed to handle exclusively Barge transported containers.

Today - To host 81 barges every day with an average berth stay of 2 hours handling 41 moves on Barges with an LOA of 110 meter (safe mooringspace @ 130 meter) one is to allocate 900 Mtrs quay length permanently to handle exclusively barges. The current facilities – excluding Maasvlakte II facilities – offer 7,500 meter berthing space resulting that 12% of the current Rotterdam Container Terminals Berth capacity is used to handle exclusively Barge transported containers.

For the evaluation of Barge Operations in the Port of Rotterdam we looked at the 7 main container terminals at Maasvlakte i.e. Maasvlakte 1 and the 2 upcoming Terminals on Maasvlakte 2. (see Figure below).



The Maasvlakte area is covered by following operators.



Hutchison Port Holdings – ECT

Company	Euromax Terminal R'dam	3
Location	Maasvlakteweg	
Sector	Deepsea/feeder/barge	
Internet	www.ect.nl	
Quay Length	1,500 m	
Draught	16.8 m	
Plot	84 ha	
Cranes	16	
Reeferplugs	2,136	
TEU Cap	-	

Company	ECT Delta Terminal	7
Location	Europaweg	
Sector	Deepsea/feeder/barge	
Internet	www.ect.nl	
Quay Length	3,600 m	
Draught	16.65 m	
Plot	265 ha	
Cranes	38	
Reeferplugs	3,387	
TEU Cap	-	

Company	ECT Delta Barge Feeder Term.	8
Location	Europaweg	
Sector	Feeder/barge	
Internet	www.ect.nl	
Quay Length	800 m	
Draught	10.5 m	
Plot	7.5 ha	
Cranes	3	
Reeferplugs	-	
TEU Cap	-	



APM terminals

Company	APM Terminals Maasvlakte II	2
Location	Europaweg	
Sector	Deepsea/feeder/barge	
Internet	www.apmterminals.com	
Quay Length	1,000 m (barge 500 m)	
Draught	19.65 m (barge 9.65 m)	
Plot	86 ha	
Cranes	8 deepsea, 2 barge, 2 rail	
Reeferplugs	4,500	
TEU Cap	2,700,000	

Company	APM Terminals Rotterdam	5
Location	Coloradoweg	
Sector	Deepsea/feeder/barge	
Internet	www.apmterminals.com	
Quay Length	1,600 m	
Draught	16.65 m	
Plot	100 ha	
Cranes	14	
Reeferplugs	2,250	
TEU Cap	3,250,000	

DP World – RWG

Company	Rotterdam World Gateway	1
Location	Amoerweg	
Sector	Deepsea/feeder/barge	
Internet	www.rwg.nl	
Quay Length	1,700 m	
Draught	19.5 m	
Plot	108 ha	
Cranes	14	
Reeferplugs	1,700	
TEU Cap	2,350,000	

The Maasvlakte area include Delta II where APMT2 and RWG will become operational 3rd – 4th quarter 2014. Both these terminals have dedicated Barge facilities of 500 meter quay length and dedicated cranes although the draft alongside quay leaves the handling of feeder vessels open. This will allow for the handling of barges separately without impacting the berth capacity for ocean vessels. This is currently sufficient however as indicated in para 4, the current – likely including the upcoming Maasvlakte II Terminals – capacity is today already stretched to its maximum.

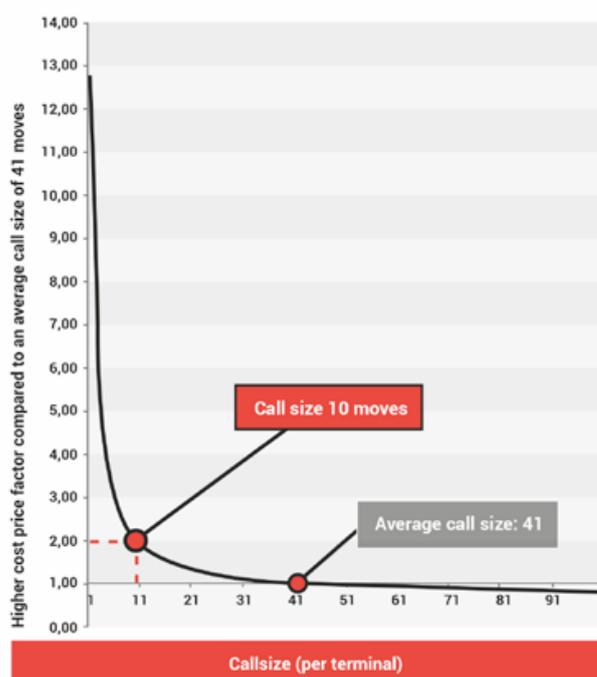


Figure 14 – Source Kramer



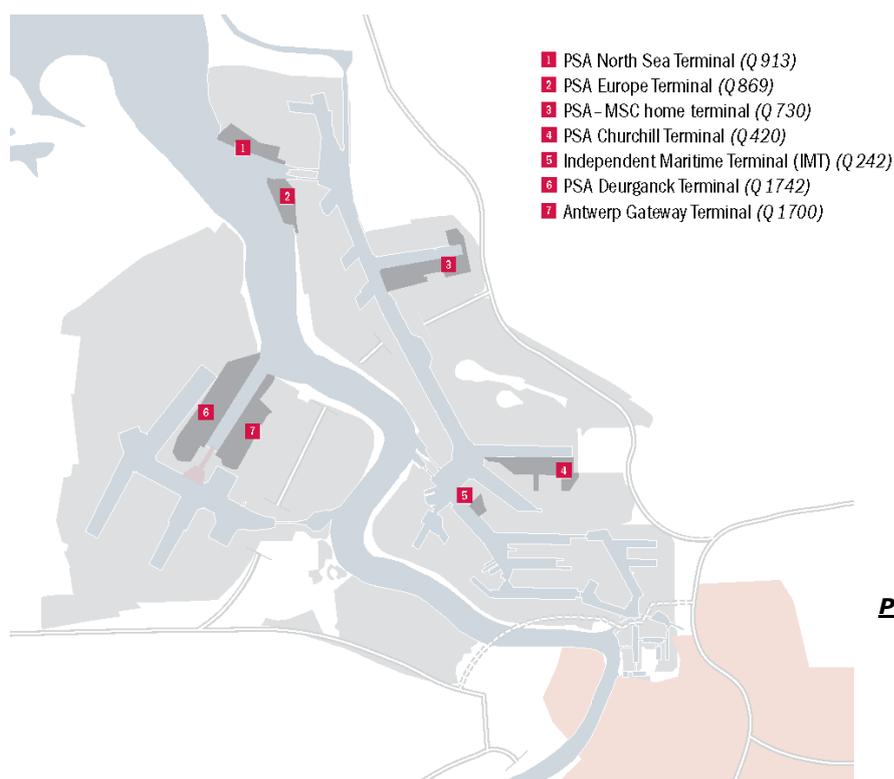
Based on the current average number of moves it is estimated that the handling cost to handle a barge with only 10 moves is double compared to barges with 41 moves (Figure 14)

If we assume that the economic break-even point to handle a barge in a cost effective manner is 80 moves and the current handling rate is 70.- Euro we can establish that the base cost to operate a barge is 5,600 Euro.

6. Antwerp - Barge Operations @ Container Terminals

The main Container Terminals in Antwerp are spread over right bank facilities behind locks and left bank facilities in the tide bound Deurganckdock. With exception of the small IMT facility at Quay 242 and as a consequence of the Hessenatie – Noordnatie merger and later the acquisition of Hess-Noord Natie by PSA are all other right bank facilities in hands of PSA. At Deurganckdock we find 2 operators i.e. PSA at Q1742 and DP World's Antwerp Gateway Terminal at Q1700. It is thus safe to conclude that all container activities in the port of Antwerp are in hands of 2 players being DP World and PSA. Both operators did engage in Joint Ventures with major carriers. PSA is running the 4 million TEU facility at Q730 with MSC while DP World is operating in strategic partnerships with a.o. CMA-CGM at Q1742 (Figure 15).

The logistic challenges between the respective right bank and left bank facilities are considerable as they are separated by locks and the Scheldt river which makes shifting between these facilities an expensive and cumbersome challenge. Recent developments will result that PSA – MSC activities will move to Deurganckdock Q1742, the PSA facilities of Q730 will be re-assigned and the future of the PSA Q420 facilities is yet unclear. PSA is operating overall 3 tidal facilities not hindered by locks which most Shipping Lines like to avoid – not to speak of the strong opinions of the Captains of their vessels for moving through Locks. While P3 declared a more important role for Antwerp it is yet to be seen what the impact on the two operators will be and how it will impact the left bank – right bank balances.



**Figure 15 – Source
Port of Antwerp Authority**



A recent study with the cooperation of 16 Antwerp Container Operators waterfront connected handing barges revealed that the situation of fragmented barge operations in Antwerp is even more distressing compared to Rotterdam.

When focussing on the 2 major operators jointly representing 73% of the barge handling throughput spread over 6 facilities we established following tendencies (Figure 16);

- The 2 operators account for an annual throughput of 1.3 million barge moves
- They jointly handle averagely over 100 barges / day
- Assuming Terminal 2 is handling barges 24/7 they receive 163 barges per week
- The overall average number of moves / barge is less than 33 – the same for all 16 operators (Rotterdam 41 moves)
- Frequency of barges calling a single terminal can mount up to one barge every hour to be handled – 23 barges within 24 hours with averagely 51 moves – requiring at least 2 hours of operation each.
- All 16 operators at any given time have to reserve total 1,600 Meters Berth Capacity or in practice 1 slot of 135 meter 24/7.
- Terminal 2 will need to allocate 3 berthing slots of 130 meter permanently

A part of the problem can be traced back to the size and intake capacity of the Barges. While a barge CEMT class “Va” can move 200 TEU or anything between 100 and 200 containers – moves, and while the market is dominated by Brokers and Inland Terminal & Logistics operators we see that single barges are used to serve several terminals in one or more ports. Assuming that a Rhine operator serving large shippers (see above 4.C) they will need to deliver to several Shipping Lines and consequently serve different terminals. Under pressure from shippers and shipping lines the Terminal Operator will be obliged to serve such barges on demand irrespective whether such Barge call is convenient or not.

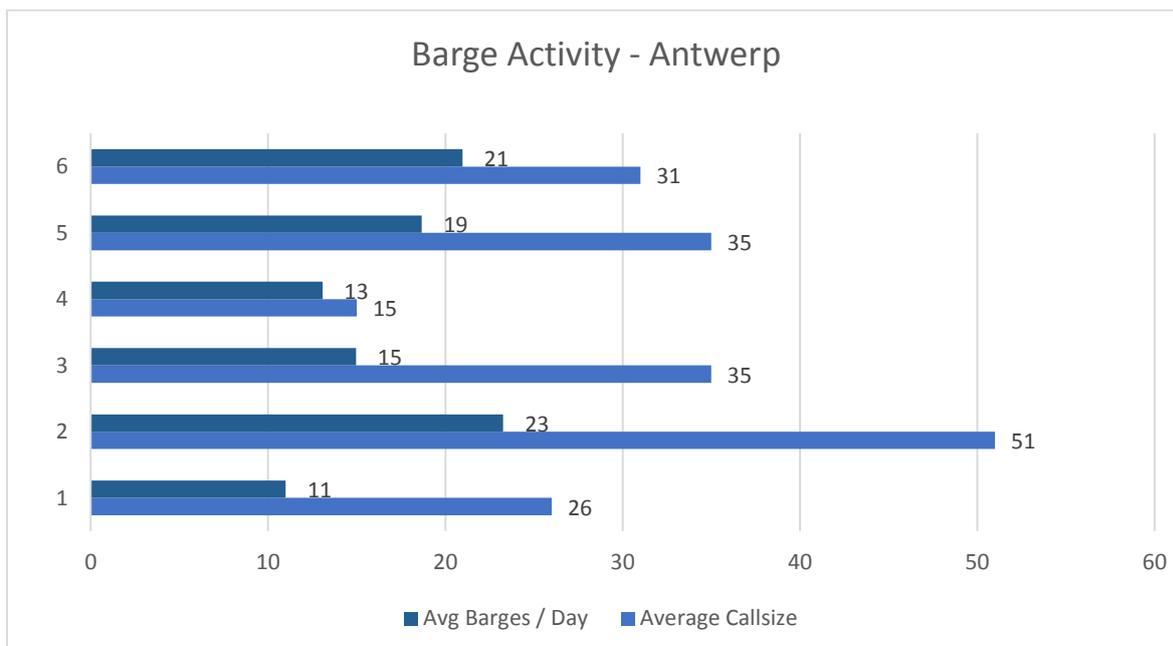


Figure 16 – Source Port of Antwerp Authority



The challenges for Barges in Antwerp are aggravated where the Left Bank Container Terminals are separated from the Right Bank Terminals by the river Scheldt and locks. From the 16 facilities, 2 are located on the Left Bank behind the Kallo Locks, 2 on the Left Bank at the Deurganckdock tidal impacted but direct accessible from the river Scheldt, 2 Terminals are located on the right bank on the River Scheldt while all other 10 facilities are located behind the locks. Apart from stowage and load planning challenges this also causes serious issues in planning berthing schedules where lock coordinators obviously prioritise ocean vessels prior inland barges.

A concrete example:

MS Postman (CEMT Class Vb Barge – 492 TEU Capacity – 135 * 17.5) loaded 82 * 20FT containers in Germany for Antwerp. The shipper is a Cellulose producer delivering the containers for their own account to several shipping lines in Antwerp. The delivery schedule in below table is a typical example showing the root cause of the problems barges experience in Antwerp and Rotterdam.

Location	Arrival	Start OPS	Moves	Depart
242 Rightbank Inside Locks	12:20	12:30	4	12:45
1700 Leftbank Outside Locks	14:30	14:40	5	15:10
869 Rightbank River	16:00	16:15	9	16:40
730 Rightbank Inside Locks	21:00	09:00	64	12:05
Total Portstay Hrs	23:45			
Moves /Hour	2.69			
Barge Cost per day Incl Fuel	€ 3,425			
Barge Cost / TEU - 82 TEU	€ 53.52			
Barge Cost / TEU - 400 TEU	€ 6.96			

At a daily cost of 3,000 Euro and 425 Euro fuel consumption, (representing 40% of the fuel consumption of the whole trip loaded Germany / discharged Antwerp) we find the cost of this operation in Antwerp to mount to 53.25 Euro/TEU. Today, Barge owners are offered 10.-Euro / TEU for Intra-Port shunting services in Antwerp or Rotterdam. On a fully utilised barge, the cost would be 7.- Euro / TEU.

7. Initiatives

Parties – mainly Port Authorities or Organisations sponsored by Government and/or EU subsidies – make considerable efforts to develop their ports in a sustainable manner. This is driven by respect for People, Planet and Profit and is demonstrated by initiatives encouraging the usage of Rail and Barge transportation to and from their ports.

Investing jointly with Governmental and Regional Authorities in Rail infrastructure and expanding Inland Navigation Facilities are few of the positive developments. Ports do encourage and even engage in the development of Inland Barge and Rail facilities through operating agreements and participations.



Both the Port of Rotterdam and Antwerp acknowledge the challenges in terms of berth capacity for Barge Operations and initiated cross-stakeholder initiatives to support planning efficiency. The objectives of both Projects are similar;

- The improvement of the Integrated Planning of Terminals and Depots in the Port
- To realise the efficient consolidation of streams (Call Optimisation)
- Measure Performance
- Effective Information Exchange

The **Port of Antwerp** Authority developed in-house the BTS (Barge Traffic System - <http://www.portofantwerp.com/nl/node/4667>) where 16 facilities handling containers are encouraged to participate. While the Port of Antwerp Authority is the driver of BTS, the 2 main Container Terminal Operators PSA and DP World are actively contributing to the next phases. Overall the system works well and will resolve part of the issues Container Barges and Terminal Operators are facing in Antwerp. As the BTS development is a continuous process they entered recently in the next phase of BTS development.

The **Port of Rotterdam** recently started a similar programme named "NextLogic" (<http://www.nextlogic.nl/uk/>). The IT solution they intend to develop as a common planning platform is named "BRAIN". Although BRAIN is not operational yet, NextLogic is also entering into the next phase of development. While the NextLogic Team visited the BTS Team in Antwerp, it seems that they are about to re-invent the wheel again intending the deployment of a Rotterdam exclusive IT solution. This would be a sensible approach if and when the underlying Business Processes of Integrated Planning of Terminals and Depots for Barges would be fundamentally different in Rotterdam compared to Antwerp.

While such planning tools will add value to the operational processes between Barges and Terminals, it does not contribute to resolving the fundamental problem of fragmented Barge utilisation, the diversity of container supply per Barge and the consequent excessive number of barges to be handled every day versus the available berth capacity of the Terminals. BTS and BRAIN will – with all the best of intentions - only address the symptomatic issues and not resolve the fundamental challenges in the Barge Industry.

Kramer Group jointly with the CBRB (Central Bureau for Rhine, Barge and Inland Shipping) conducted a study resulting in the BSC concept (<http://www.bargeservicecenter.nl/?lang=en>) The study evaluated the opportunities for developing a Barge Service Center (Sites 4 and 6 on the map Page 14). Part of the findings and logic in this paper match with the BSC study and conclusions.

Company	Rotterdam Container Terminal	4
Location	Missouriweg	
Sector	Shortsea/barge/feeder	
Internet	www.kramergroup.nl	
Quay Length	400 m	
Draught	10 m	
Plot	17 ha	
Cranes	3	
Reeferplugs	100	
TEU Cap	500,000	

Company	Delta Container Services	6
Location	Missouriweg	
Sector	Feeder/barge/depot	
Internet	www.kramergroup.nl	
Quay Length	260 m	
Draught	12 m	
Plot	2.5 ha	
Cranes	1	
Reeferplugs	-	
TEU Cap	150,000	



The study concluded that bundling of container numbers to and from the various seaport terminals at Maasvlakte through a Barge Service Centre (BSC) will provide a real solution within a short period of time.

Rotterdam Container Terminal (RCT) of the Kramer Group has been identified as the best suitable location for the operation of the BSC. The effects are beneficial for both barge operators and seaport terminals.

A BSC at RCT can also be launched immediately in a cost-effective manner and without requiring complicated agreements. It is in the communal interest of the Port of Rotterdam, the seaport terminals and barge operators that agreements are quickly reached on the operation of a BSC. A condition to be fulfilled for the smooth and cost-efficient operation of a BSC at Maasvlakte is the connection of all seaport terminals, empty container depots and the BSC to the Internal Road System which allows for the transportation of containers on 10-teu multi-trailer systems.

8. Recapitulation

- ✓ Antwerp & Rotterdam are located within the EU Barge intense region connecting the German Rhine-Ruhr, France, The Netherlands and Belgium through Inland Waterways.
- ✓ There is little synergy between the capacity of the Inland Navigation Infrastructure and the CEMT Class Barges available in the market. Small Barges are often used for Intra-Port shunting services while the intake capacity of CEMT Class Va and Vb barges is poorly utilised.
- ✓ Most of the European Barge Fleet is owned by single barge owners who invested in new tonnage on basis of 2005-2007 Business Plans while at time of delivery in 2008-2009 the market for Inland Navigation collapsed
- ✓ Brokers add value to some extent by consolidating volumes within designated trade lanes as much as possible however are not sharing the burden of rate pressure and tariff devaluation fairly by balancing this exclusively on Barge Owners
- ✓ The German Barge scene has seen a consolidation of operators establishing a virtual monopoly by holding both the Barge services and Inland Terminals under control limiting the efficiency and effectiveness of 3rd party operators
- ✓ Container Terminal Operators are confronted with an excessive number of barges presented by different stakeholders and lack the courage to enforce barge operation services on cost recovery basis
- ✓ Shipping Lines abstain from seriously entering into Multimodal operations partly due to lack of sufficient volume or strategies established to preserve their relations with large logistic service providers by not entering into added value services on the landside
- ✓ The Container Terminal Operators have committed through their Concession Agreements with Port Authorities to change the balance of Road – Rail – Barge processed containers to the benefit of increasing the Barge transported portion



- ✓ The Container Terminals in Rotterdam receive Barges with average 41 moves per call occupying considerable and disproportional berth capacity exclusively assigned to Barge operations in a 24/7 working program
- ✓ The Container Terminals in Antwerp receive Barges with average 33 moves per call occupying considerable and disproportional berth capacity exclusively assigned to Barge operations in a 24/7 working program
- ✓ Initiatives to optimise berth planning in the Ports of Antwerp (BTS) and Rotterdam (NextLogic) are not addressing the fundamental problems of underutilised barge capacity and do not resolve the issue of low move count and inefficient usage of Berth & Terminal Resources

9. Suggestions

There is no single solution to improve the current situation, nor is there a single stakeholder holding the key to Inland Navigation efficiency. Fact is that already today we see a need for action. Leaving the situation as-is today is irresponsible from a Profit point of view, it would disregard People en be unrespectfull for the Planet. It is thus unsustainable.

EBS (European Barge Shuttle) By the Barge and Inland Terminal Operators

From a cost efficiency viewpoint and in the interest of their customers Inland Barge Operators are to set-up JVC's P3 alike. Establish a Barge Shipping entity where all partners entering their tonnage and let this JVC unit deploy and operate a tailored barge fleet. The JVC unit will operate as a cost centre maximising intake of available barge capacity and consolidate volumes to reduce the number of Terminals in the Hinterland and in the Ports. The partners will commit and buy-in 80% of the capacity with own controlled volumes while 20% will be marketed for 3rd party spot business in as far as it fits in the fixed schedule, rotation and Terminals calling.

Barge Handling Sliding Scale By the Port Container Terminals

Today the Ocean Container Terminal Operators are not recovering the cost of operating barges. With averagely 41 and 33 moves per barge in respectively Rotterdam and Antwerp they handle barges at a loss.

It can be argued that the fixed cost for loading /discharging a barge relates to administration by producing discharge lists, loading and stowage plans, walking time of gangs, allocating straddle carriers or other handling equipment, positioning cranes etc.. can be recovered when the number of moves breaks-even at a minimum.

From earlier calculations we learned that the minimum fixed cost prior handling the first container is estimated at 5,600 Euro.



On this basis the Terminal Operator can rightfully claim a sliding scale tariff starting with a fixed cost per barge of 5,600 Euro covering the first 1 to 80 moves. It will force the Barge Operator to make choice out of 3 options based on economic parameters;

1. Go with a barge of >80 moves for direct discharge to the Ocean Terminal
2. Discharge barges with <80 moves to a consolidation point
3. Plan his barges to maximum intake capacity to one or maximum 2 Ocean Terminals

Below table is a simulation of the impact of a sliding scale tariff with a base cost minimum.

Sliding Scale							
From	To	Moves	Rate / Move	Cost SSC	Total SSC	Cur. Cost	Cost / Move SSC
1	10	10		€ 5,600			€ 560
1	20	20		€ 5,600			€ 280
1	50	50		€ 5,600			€ 112
1	80	80		€ 5,600			€ 70
1	80	80	€ 70	€ 5,600	€ 5,600	€ 5,600	€ 70
81	120	40	€ 65	€ 2,600	€ 8,200	€ 8,400	€ 68
121	200	80	€ 60	€ 4,800	€ 13,000	€ 14,000	€ 65
201	360	160	€ 55	€ 8,800	€ 21,800	€ 25,200	€ 61
361	600	240	€ 50	€ 12,000	€ 33,800	€ 42,000	€ 56

A barge with 120 moves would save already 2% on the handling cost while a barge with 600 moves would save 20% on the handling cost. Obviously a barge with 10 moves would pay 8 times over the standard tariff and prefer to discharge these 10 units at a consolidation point and absorb the on-carriage from the consolidation point to the Ocean Terminal. He would have 490 Euro to spend for this operation.

If we apply this tariff to the Concrete Example in Chapter 6, the 64 containers would cost 88.- Euro / move or 25% over the current move rate. To discharge the 18 remaining containers direct on 3 Ocean Terminals would cost 3 * 5,600.- Euro or 933.- Euro /Move. Transferring these 18 units over a consolidation centre where they can be re-loaded on a intra-port shuttle barge on full capacity would cost less than 200.- Euro / unit.

From this analysis it appears that the main terminal operators in the ports can establish such a consolidation centre at the port "Gateway" and thus create an extended Gateway from which all parties will benefit;

- The Barge Operator will optimise the intake capacity utilisation of each barge either direct or through JVC's, slotswaps or an EBS alike set-up
- The turnaround time of the barges will be reduced considerably (in the concrete example the barge would call 1 Terminal and the Gateway reducing the port stay from 24 to 4 hours.
- Ocean Terminals will benefit in many ways not least by a better utilisation of material and human resources, assets and infrastructure
- Planning of load and discharge operations of Ocean Vessels at Ocean Terminals can be linked to the Extended Gateway stacks allowing for better yard utilisation and planning



10. Conclusions

This paper has the sincere intention to provide an upright view on the current situation of Inland Navigation in North West Europe. It has by no means the pretention to be complete nor is it claiming to be right on everything nor that it offers "million dollar" solutions. Some readers might disagree with some of the information, facts or figures. Some might feel offended however feel free to fit the shoes and point-out such differences and express disagreements – it will contribute to an open and industry wide debate from which all stakeholders can benefit. Be however aware that the information is sourced from insiders and main stakeholders in the Transportation Industry and shared out of a genuine sense of concern and urgency to take action.

Only when we keep an open mind and focus on the real important objectives on how to develop our multimodal and logistic operations in a sustainable way with empathy to future generations we will be able to keep the engine oiled and moving.

Transporting 45% by Barge by 2035 is a less than ambitious target – we can and need to do better and reach this target much sooner if we want. Transporting goods over inland waterways is a key factor to the possible solutions where we see that current Infrastructure of canals and rivers on the one hand and cargo carrying capacity of the Barges on the other hand have all the potential to meet the objectives of current and future sustainable logistic solutions. A platform balancing People, Profit and Planet is a solid foundation for such developments. This study a modest contributor.

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