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Peer review of existing studies regarding the expansion of capacity at Port of Antwerp

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Drewry background and scope discussion

Drewry Background

- Founded in 1970
- Drewry is an independent research and advisory organisation for the maritime sector.
- Our research and advisory business units provide an industry leading, unrivalled knowledge base. We use our continuing research, specialist knowledge and global offices, to constantly analyse and decipher the shipping and ports sector globally.
- We combine and focus our resources for each project and each client, building trusted relationships where our advice is at the centre of commercial decision making.
- Drewry has previously been engaged by port authorities, financial institutions or market players to carry out studies which include terminal capacity assessments. Some relevant engagements in Europe from 2017 involve:
  - Vendors Due Diligence (Antwerp)
  - Breakbulk terminal performance analysis (across Europe)
  - Buy side due diligence (United Kingdom)
  - Container Terminal Market Study (key terminals in Spain)

Scope of Drewry engagement

- Port of Antwerp (PoA) has identified the need to create additional capacity of 6-7 million TEU within the Port to cater to the needs of deep sea vessels and related activities (feeders and barges). As part of this process PoA has engaged with stakeholders and developed their own studies reviewing the various options to augment this capacity in the port. A short list building blocks combined into eight alternatives is currently under evaluation. TBA has carried out a technical assessment of the potential capacity of the various building blocks. This is outlined in a technical report “20180111_eindrapport operationaliteit_geïntegreerd” “in Dutch language.
- The scope of Drewry’s engagement is to provide an independent review of this report, covering:
  - An independent view of the market context as key driver of capacity development
  - Assessment of the capacity of the eight alternatives and their constituent building blocks. The capacity assessment is not intended to be a design or simulation review but a high level assessment using appropriate benchmarks to evaluate if the space marked for development could deliver the required capacity under each alternative
  - Assess the eight alternatives from a market / commercial context

Executive Summary

Section 1

1. The growth rate of global container port traffic has slowed down notably since the financial crisis
2. During the last decade, the global liner industry has, on average, generated an EBIT margin of 1.2%
3. In order to survive, carriers implemented radical cost saving strategies, aimed at minimising unit cost, through vessel upscaling
4. This has caused the formation of operational alliances on key East-West trades, and an unprecedented wave of consolidation
5. The market structure is changing from 'perfect competition' towards (non-collusive) oligopoly on several key East-West lanes
6. Through vessel upscaling, alliances have reduced the number of services while concentrating cargo volumes onto larger ships
7. Reductions in vessel arrival rates, and increases in the number of containers exchanged per vessel call, increase the terminal operators' cost (Opex and Capex)
8. At the same time, concentration in the client portfolio increases market share volatility for terminal operators.
9. Bigger ships require fewer and larger terminals in each port. Terminal fragmentation is problematic because it increases the need for costly intra-terminal transfers.

Section 2:

10. In Drewry's view, the capacity estimated for each of the blocks in "20180111_eindrapport operationaliteit _geïntegreerd" and in the summary of capacity calculations provided in excel appears reasonable. No major outliers were identified.

Section 3:

11. The alternatives that meet the current expectations of shipping lines and terminal operators, and hence offer the lowest risk from a commercial perspective, are alternatives 1, 2, and 3.
12. The alternatives that sub-optimally meet the current expectations of shipping lines and terminal operators, and hence offer a higher risk from a commercial perspective, are alternatives 4 and 5.
13. The alternatives that do not meet the current expectations of shipping lines and terminal operators, and hence offer the highest risk from a commercial perspective, are alternatives 6, 7, and 8.

Section 1: Market context as key driver of capacity development

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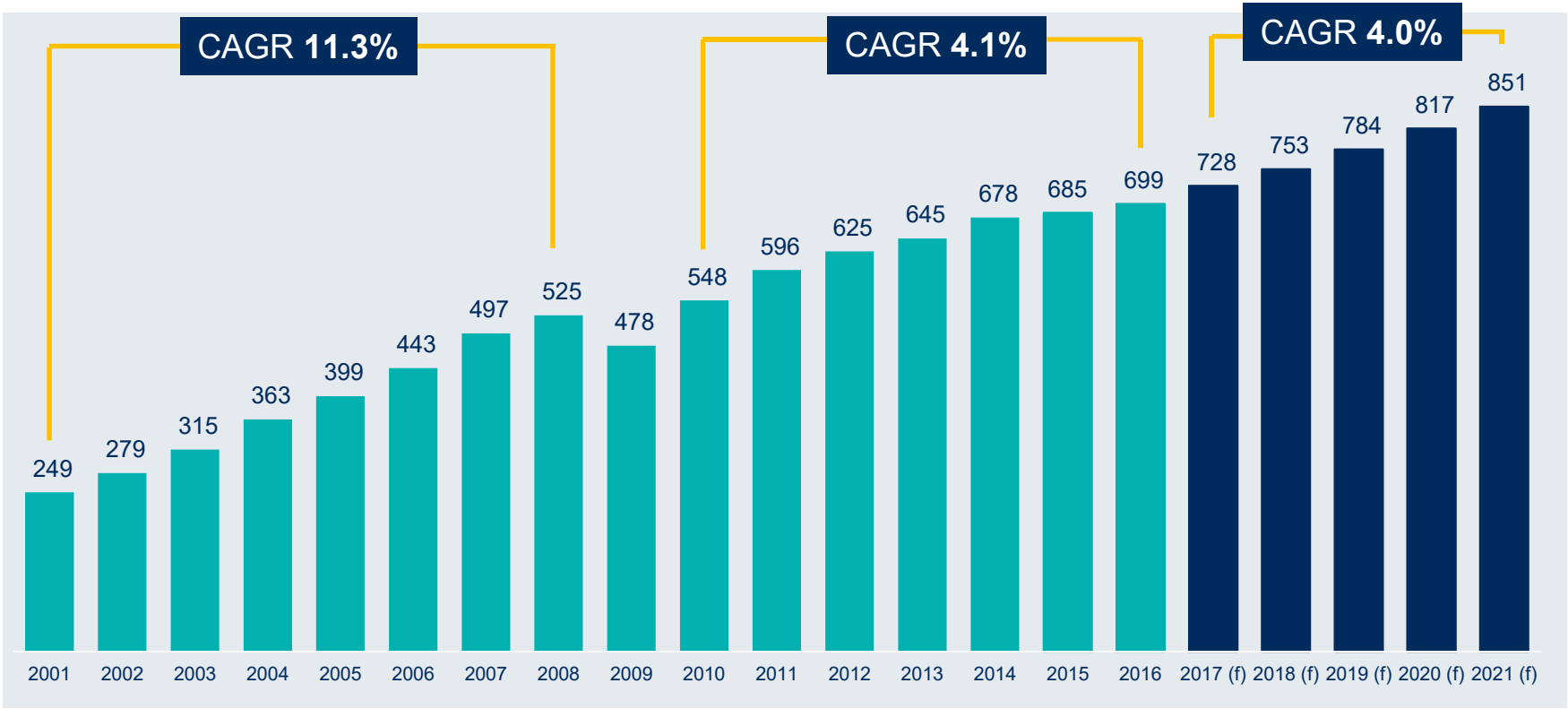
Global container port traffic growth

has slowed down notably since the financial crisis

Between 2001 and the financial crisis of 2008-9, global container port traffic grew at a compound average rate of 11.3% per annum. Since then, growth has slowed down to about 4% per annum. Drewry forecasts that this growth rate will be maintained over the next five years.

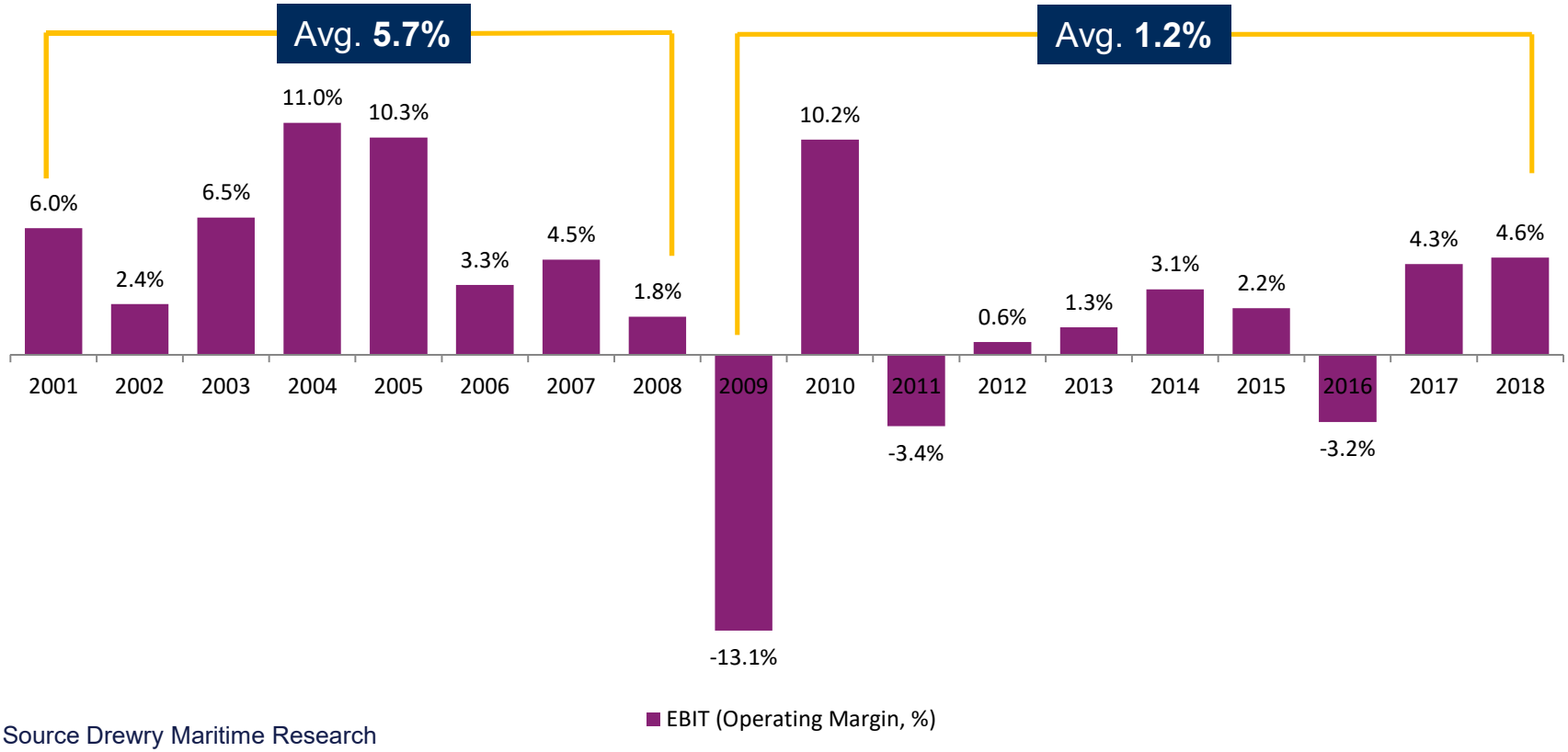


Source Drewry Maritime Research

Impacting global liner industry operating margins

which has weighed down the industry profitability

Between 2001 and the financial crisis of 2008-9, Drewry estimates that the global liner industry earned an average operating margin (EBIT) of 5.7% per annum. Since then, operating margins have deteriorated markedly to about 1% per annum which has weighed down the industry profitability.

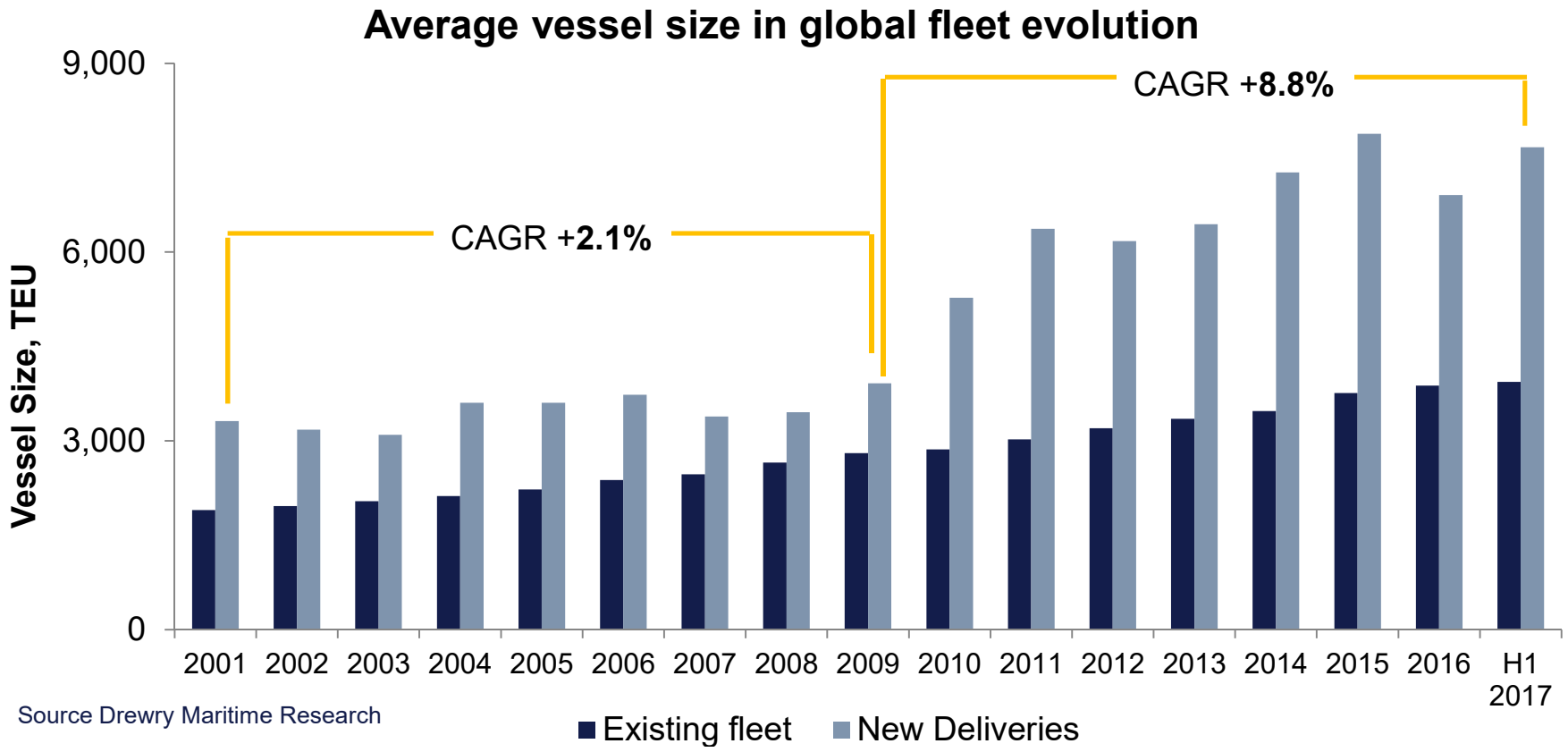


Source Drewry Maritime Research

Carriers implemented radical cost saving strategies

aimed at minimising unit cost, through vessel upscaling

In order to survive, carriers implemented radical cost saving strategies, aimed at minimising unit cost through vessel upscaling (scale economies). The compound annual average growth rate in the vessel size of new deliveries has jumped from 2.1% between 2001 and 2009, to 8.8% between 2009 and 2017.

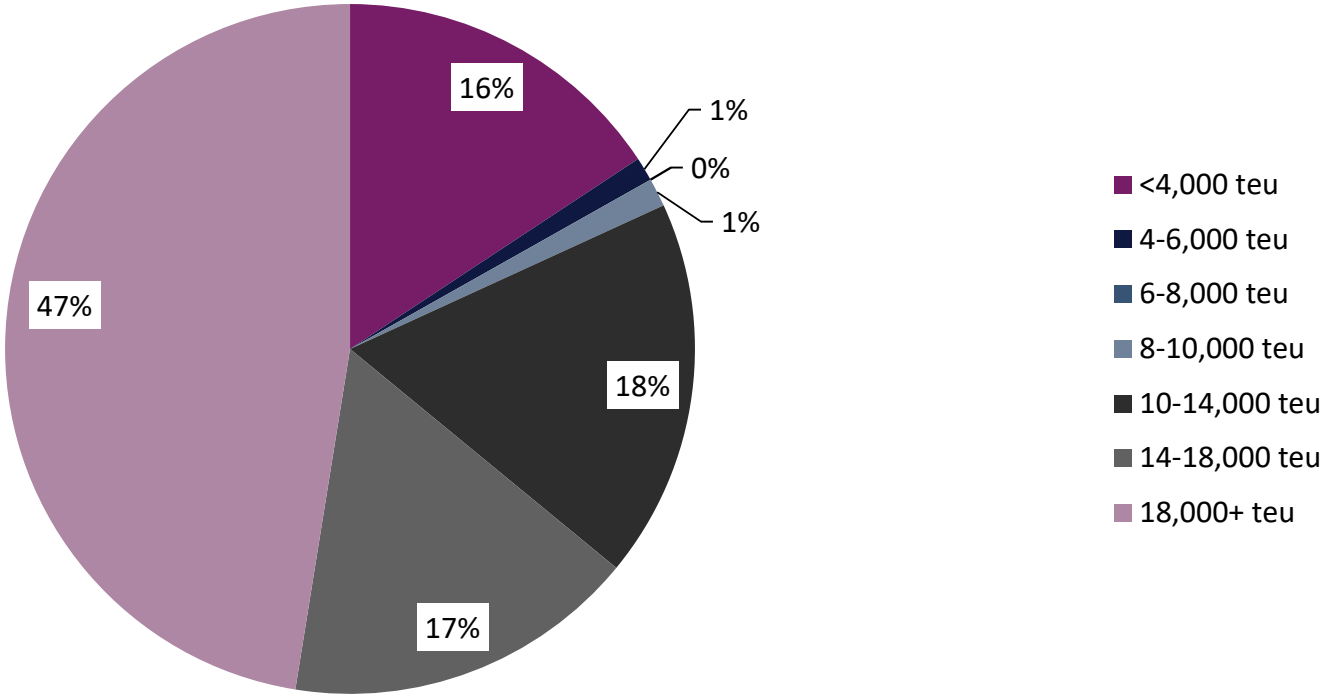


Source Drewry Maritime Research

Vessel order book

indicates that average vessel size will increase further

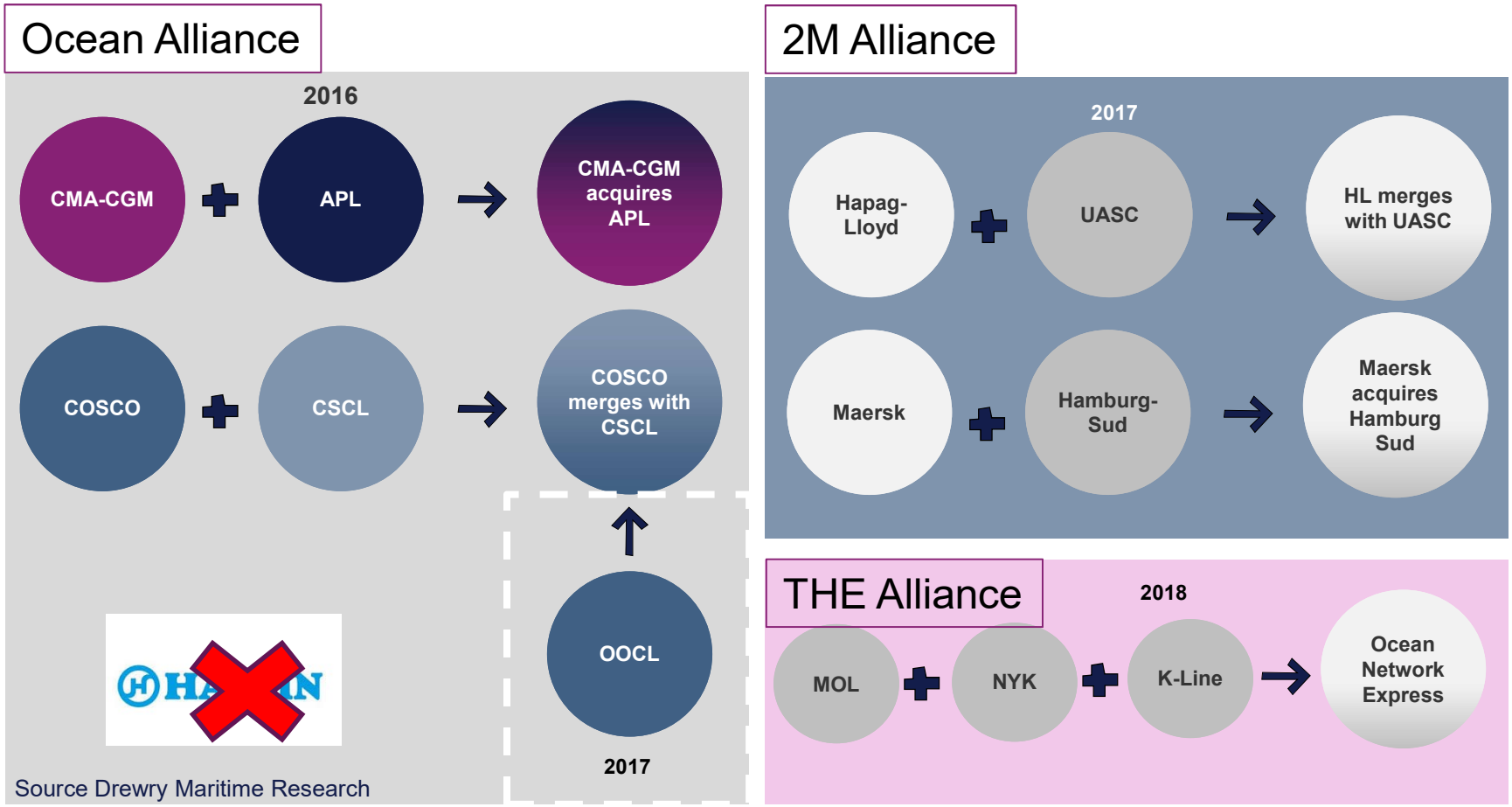
The average vessel size of ships delivered in 2017 was 7,666 TEU. With 83% of the order book for vessels over 8,000 TEU, the average vessel size will continue increasing.



Liner shipping also going through rapid consolidation

8 of top 20 global carriers acquired or merged in past 2 years

The formation of operational alliances on key East-West trades, and an unprecedented wave of consolidation among shipping lines is reshaping the industry



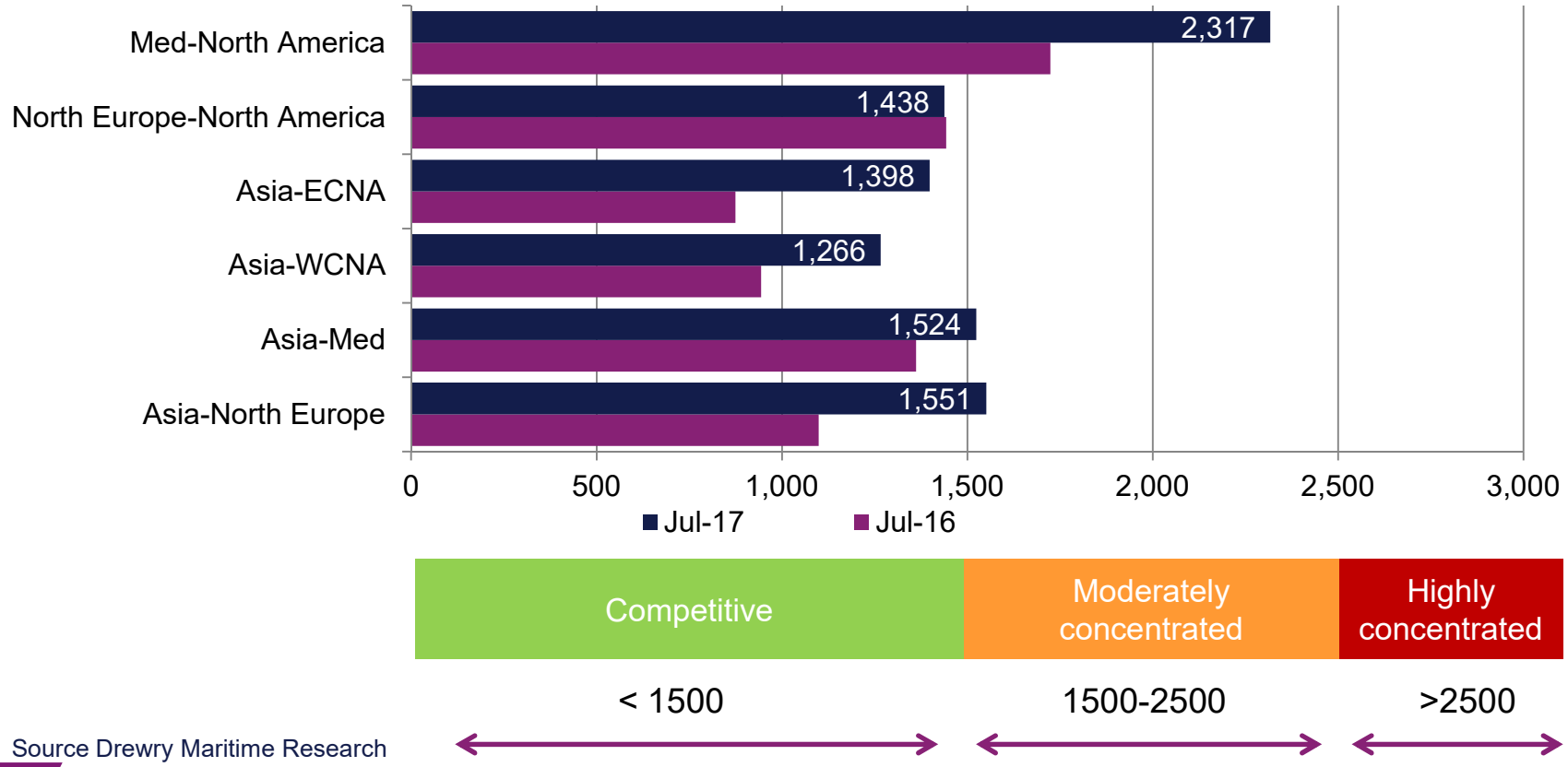
Source Drewry Maritime Research

Resulting in re-shaping the market structure

with fewer carriers on several trade routes

The unprecedented wave of M&A that manifested itself in the liner shipping industry since 2016, will re-shape the industry. The market structure on several key East-West lanes is moving from 'perfect competition' in the direction of (non-collusive) 'oligopoly'.

Herfindahl-Hirschman Index (HHI) on key East-West trades

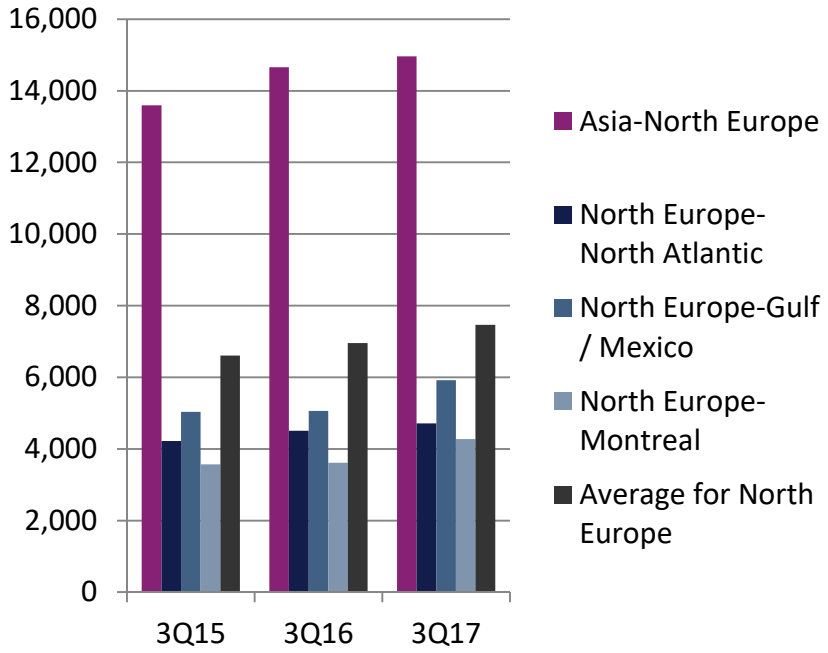


Source Drewry Maritime Research

Concentrating volume and reducing service numbers and frequency

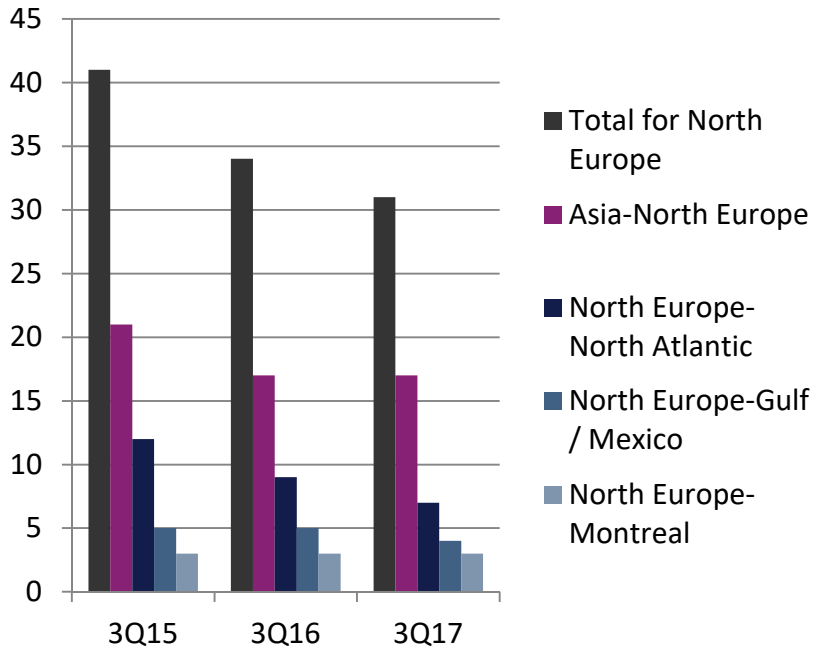
Over the last two years, alliance formation, and the vessel upscaling which it enables, has resulted in a reduction of the number of weekly services connecting North Europe with Asia and North America from 41 in 3Q15 to 31 in 3Q17, or almost 25%.

Average vessel size (nominal TEU) per trade lane



The average vessel size on the connecting Europe with China and North America increased by 5% between 3Q15 and 3Q16, and 7% the following year.

Average number of services per week per trade lane

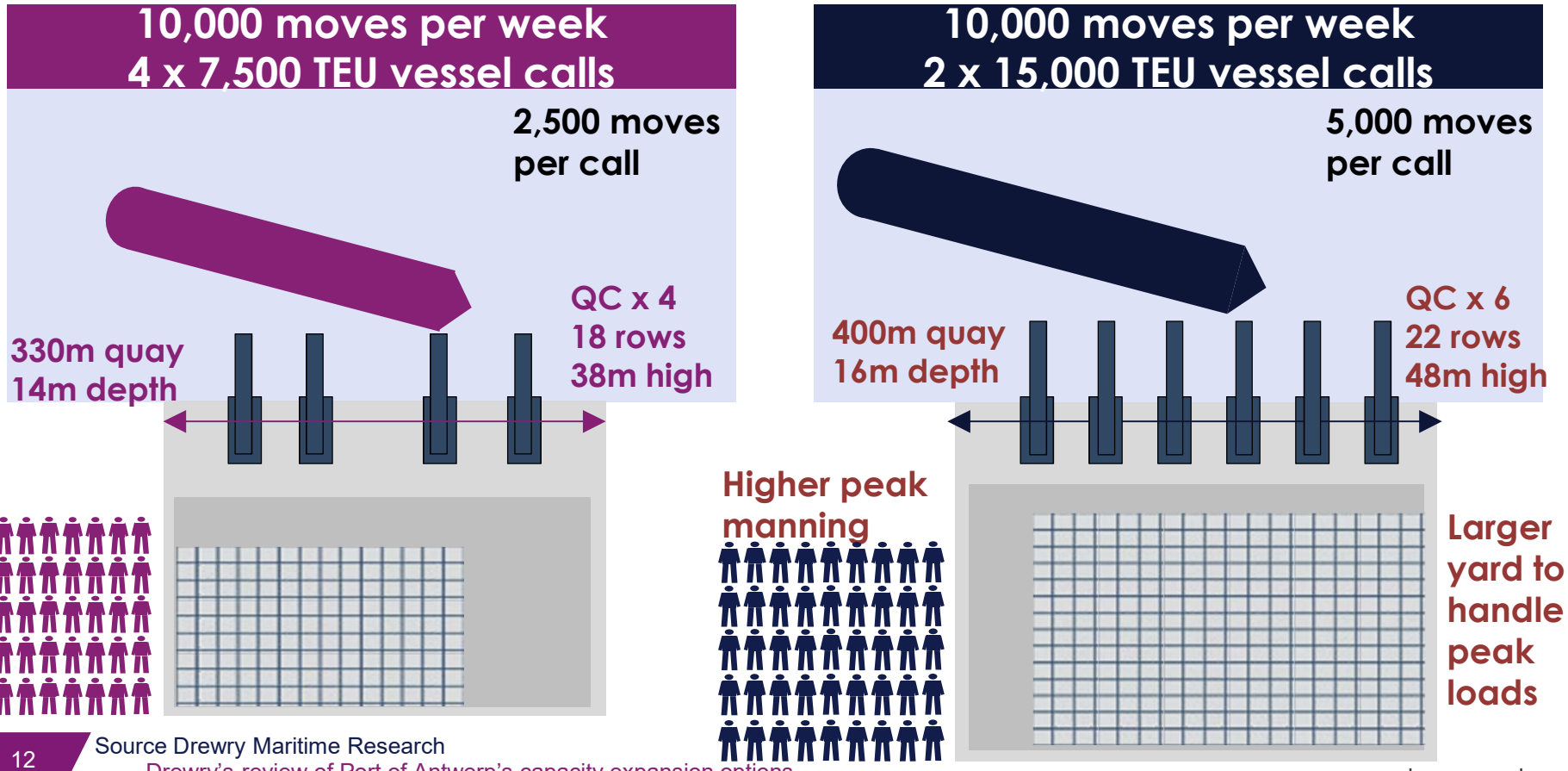


The Average number of services per week per trade lane connecting Europe with China and North America decreased by 17% between 3Q15 and 3Q16, and 8% the following year.

Terminal operator's cost however increase

with Opex and Capex are pushed up by vessel upscaling

Reductions in vessel arrival rates, and increases in the number of containers exchanged per vessel call, caused by vessel upscaling, increase the terminal operators' cost and reduce their asset utilisation. Cost increases are caused by: the requirement for larger cranes (outreach and height), more cranes, longer and deeper berths, deeper approach channels, larger or more densely stacked yard, higher crane and berth productivity, ability to handle greater peak volumes.



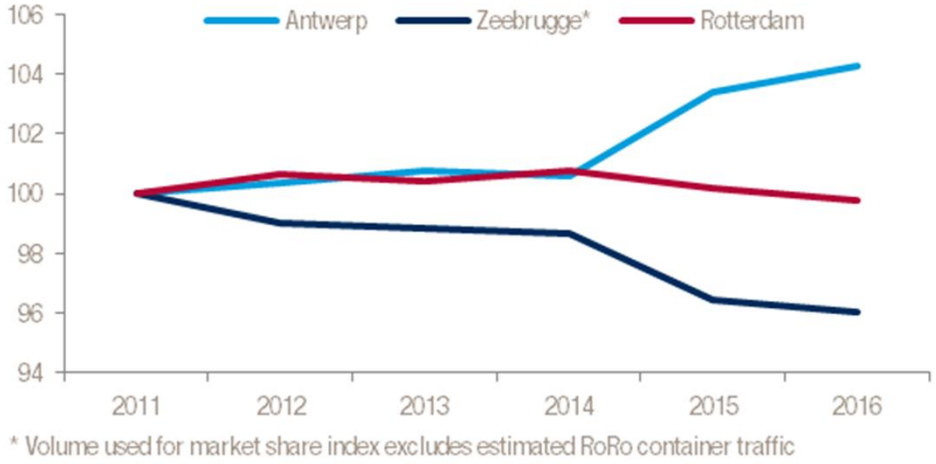
Source Drewry Maritime Research

Drewry's review of Port of Antwerp's capacity expansion options

Concentration of customers increases market share volatility

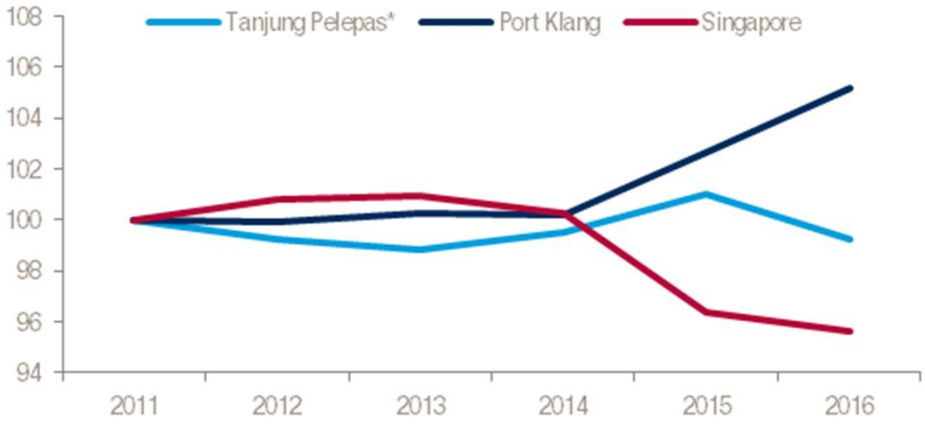
Concentration among shipping lines, which constitute the terminal operator's client portfolio, increases the commercial risk for a terminal operator, and results in markedly higher market share volatility since 2015.

INDEX OF BENELUX CONTAINER PORT MARKET SHARES, 2011-16



* Volume used for market share index excludes estimated RoRo container traffic

INDEX OF SOUTHEAST ASIAN TRANSHIPMENT HUB PORT MARKET SHARES, 2011-16

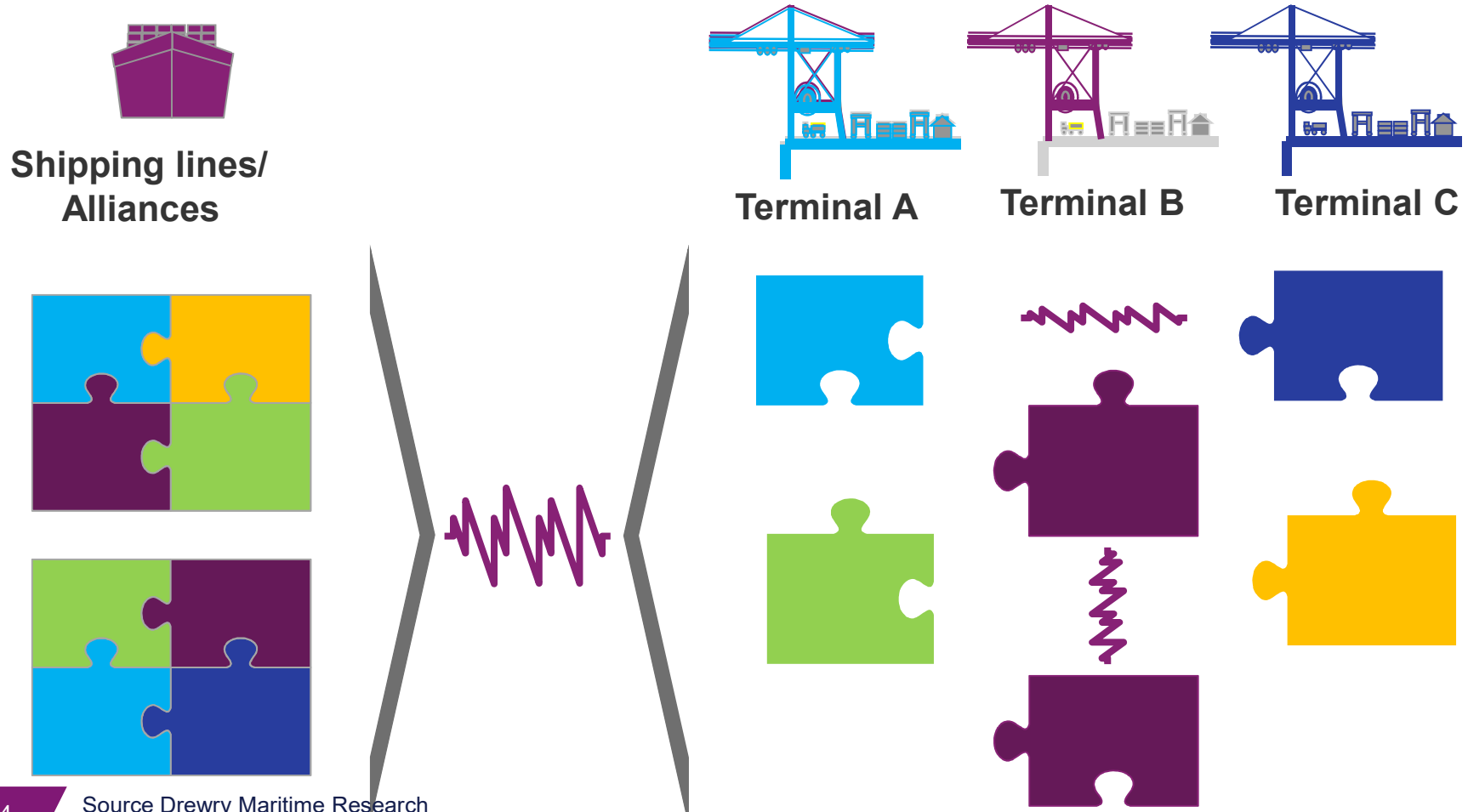


* 2016 throughput used for market share index estimated

Source Drewry Maritime Research

Requiring fewer and larger terminals in each port

Bigger ships and alliances mean that fewer, larger terminals are needed in each port. Fragmented terminal capacity is problematic because it increases the need for costly intra-terminal transfers, which also causes greater operational challenges and complexities.



Source Drewry Maritime Research

Section 2: Review of eight short listed alternatives - reasonableness of capacity additions

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Capacity review- Background, Aim and Scope, Benchmarks

Aim and scope:

The aim of Drewry's independent review of capacity is not to be a design or simulation review but a high level assessment using appropriate benchmarks to evaluate if the space marked for development could deliver the required capacity under each of the eight alternatives.

The scope covers a review of the documents below and identification of any gaps or areas of disagreement. It is not intended that Drewry would provide a separate report of capacity assessment.

Documents reviewed:

1. *20180111_eindrapport operationaliteit_geïntegreerd*
2. *20180103_rapport_Bijlage_1_Verslag workshop operationaliteit*
3. *20180103_rapport_bijlage_2*
4. *20180103_rapport_Bijlage_3_Operationele knelpunten verhuis AET terminal*

Container terminal infrastructure benchmarks are not a methodology to calculate terminal capacity however serves the purpose of a high level assessment of reasonableness of the proposed capacity additions for the various alternatives

The capacity analysis focuses on the civil infrastructure provided (quay and yard) and excludes the yard and quay equipment from the assessment therefore assuming that equipment will not be the capacity limiting factor

General benchmarks

Drewry has compared the capacity estimated in the "*20180111_eindrapport operationaliteit_geïntegreerd" report* against Drewry's global benchmarks for the following two port performance metrics:

- TEU per m of quay (quay benchmark)
- TEU per Ha of port area (yard benchmark)

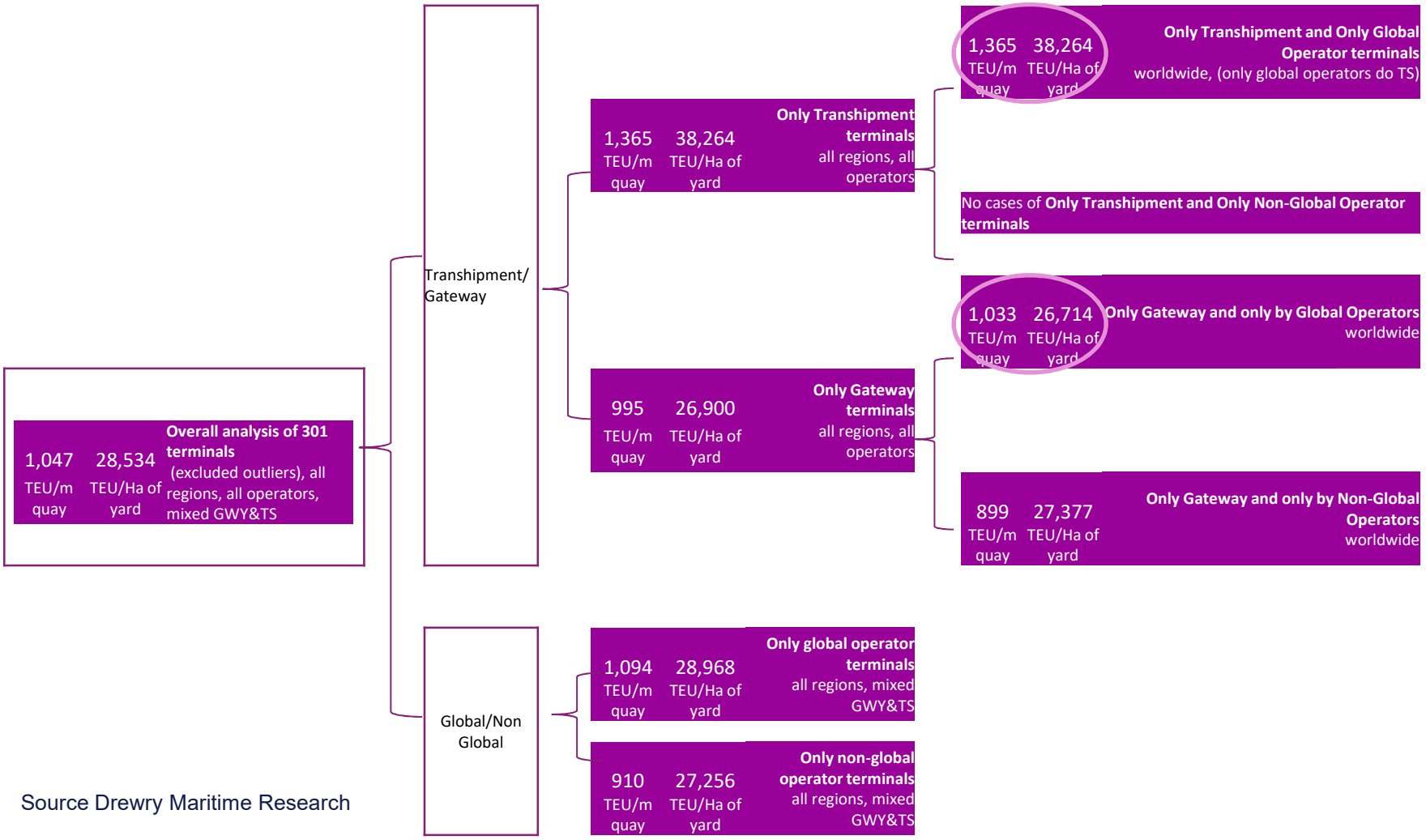
Data has been collected for around 320 terminals globally, specifically the 2016 TEU throughput, in order to have relevant comparators for the expansions planned in Antwerp. These are terminals for which actual throughput volume data was available and confirmed. This data was processed to remove outliers.

A few considerations have been made:

- Geography: Different geographical regions tend to differ with regards to productivity due to stevedoring processes, cultural approach
- Type of predominant traffic: Transhipment terminals have higher values of TEU/m quay and TEU/Ha yard than gateway terminals. Import terminals and export terminals have different infrastructure benchmarks too
- Type of operator: Global operators tend to be more productive than local/state port operators

These considerations are taken into account when selecting the relevant benchmark against which to compare the proposed Antwerp expansions.

Global terminal Benchmarks



Source Drewry Maritime Research

Capacity review- European Benchmarks

Europe specific benchmarks

Of the terminals studied, 62 were located in Europe (North East Europe, South East Europe, North Europe, South Europe).

- 51 are predominantly gateway traffic
- 11 are predominantly transhipment traffic

The sample was filtered for the following criteria:

- European region
- Terminal utilisation above 50%
- Operated by global operators

The resultant quay productivity and yard productivity benchmarks for these criteria are:

1,274 TEU/m quay	32,033 TEU/Ha of yard	**Only Transhipment + Only Global Operator + Only Europe + Only utilisation over 50%**
778 TEU/m quay	28,004 TEU/Ha of yard	**Only Gateway + Only Global Operator + Only Europe + Only utilisation over 50%**

Quay productivity and yard productivity for the Antwerp expansion building blocks

The summary of alternatives for which capacity has been calculated by Port of Antwerp and their advisors is tabled below.

alternative		Combination of Building Blocks				
1	=	1aNorth	+	1aSouth		
2	=	1bNorth	+	1bSouth		
3	=	2				
4	=	6	+	10	+	13
5	=	4a	+	13		
6	=	5a	+	5b	+	11
7	=	4b	+	12	+	14
8	=	15	+	16		

The "*20180111_eindrapport operationaliteit_geïntegreerd*" report focuses on:

- ✓ The yard area capacity is generated by the available land area, in Ha. As a consequence, Drewry's review is based on the assumption that the necessary yard and quay equipment will be provided by the terminal operator, and will not be the limiting factor.
- ✓ Similarly, the quay capacity as generated by the available length in m but does not take into consideration the capacity generated by the quay gantry cranes

Since the capacity analysis focuses on civil infrastructure provided (quay and yard), the relevant benchmarks are quay performance (TEU/m) and yard performance (TEU/Ha).

Capacity review- Transhipment Incidence

Transhipment assumptions

The "*20180111_eindrapport operationaliteit_geïntegreerd"* report divides the building blocks in 4 types:

1. blocks that exist as independent transhipment terminals
2. blocks that that exist as independent gateway terminals
3. blocks that exist as an expansion to existing transhipment terminals
4. blocks that exist as an expansion to existing gateway terminals

The "*20180111_eindrapport operationaliteit_geïntegreerd"* report has assumed that the transhipment incidence in the new building blocks will be as per the adjacent/nearby existing terminals:

- ✓ Europa Terminal (gateway terminal): 11%
- ✓ Noordzee Terminal (gateway terminal): 11%
- ✓ Antwerp Gateway Terminal (gateway terminal): 11%
- ✓ MPET (transhipment terminal): 54%

This is in Drewry's opinion a reasonable assumption, and the implications are tabled below.

Transhipment Ratios			
building blocks that exist as independent transhipment terminals	1a. Saeftinghedock South		54%
	1.b Saeftinghedock South (+ village of Doel)		
	2. Saeftinghedok only South side		
building blocks that exist as independent gateway terminals	1a. Saeftinghedock North		11%
	1.b Saeftinghedock North (+ village of Doel)		
	13. Extension of Noordzeeterminal full		
	14. Ctr terminal @ Delwaidedok		
	15. ctr terminal 'Schaar van Ouden Doel'		
	16. Ctr terminal @ Verrebroekdok		
building blocks that exist as an expansion to existing transhipment terminals	4a. Riverterminal Northwest	extension of MPET west terminal	54%
	4b. Riverterminal Northwest limited		
	5a. Waaslandkanaal/Doeldok optimized		
building blocks that exist as an expansion to existing gateway terminals	5b. Waaslandkanaal Noordelijk Insteekdok	extension of Deurganckdok east	11%
	6. Ashland	extension of Antwerp Gateway	
	10. Extension of Europaterminal	extension of Europaterminal	
	11. Extension of Noordzeeterminal optimized	extension of Noordzeeterminal	
	12. Extension of Noordzeeterminal limited		

Capacity review- Analysis

Analysis:

For each of the building blocks Drewry has assumed that "calculated capacity" as outlined in the "*20180111_eindrapport operationaliteit_geïntegreerd"* report is the operational capacity.

Since the Drewry benchmarks measure actual throughput, we had align both measures. To do so, we used the average rate of utilisation of our sample, which is 65%. Consequently, Drewry has estimated that, for each of the building blocks, the throughput is approximately 65% of the operational capacity.

Based on the Operational Capacity of each building block, Drewry has:

- Derived the relevant TEU per m of quay (quay performance) and TEU per Ha of port area (yard performance)
- Compared them against its benchmarks, using different benchmarks for transhipment terminals and for gateway terminals

The analysis is presented overleaf.

The main observations are:

- The capacity estimated for each of the blocks in "*20180111_eindrapport operationaliteit_geïntegreerd"* and in the summary of capacity calculations provided in excel appears reasonable, based on Drewry's infrastructure performance benchmark approach. No major outliers were identified.
- For Block 10, the TEU per Ha of yard seems high at 39,000. This is because the reported capacity of 2.4 MTEU is actually the capacity generated by the quay but in reality the capacity of this building block is limited by the capacity of the yard area which is just 1.6MTEU. Drewry recommends that the capacity of Block 10 is referred to as 1.6MTEU

Capacity review- Analysis

	Quay lenght (deepsea) m	Quay length (dedicated barge) m	Total Quay length m	Gross area Ha	Assumed T/S share	Calculated terminal capacity TEU	Estimated throughput (=65% of capacity)) TEU	TEU per m quay based on estimated throughput *For total quay length*	TEU per Ha of yard based on estimated throughput *For total yard area*	Type of terminal		TEU per m quay Drewry benchmark	TEU per Ha of yard Drewry benchmark
										T/S or Gateway	Independent or extension of existing		
1a. Saeftinghedock South	1,400	300	1,700	104	54%	3,700,000	2,405,000	1,415	23,125	T/S	INDEP	1,365	38,264
1.b Saeftinghedock South (+ village of Doel)	1,400	150	1,550	107	54%	3,400,000	2,210,000	1,426	20,654	T/S	INDEP	1,365	38,264
2. Saeftinghedok only South side	2,750	300	3,050	171	54%	6,600,000	4,290,000	1,407	25,088	T/S	INDEP	1,365	38,264
1a. Saeftinghedock North	1,437	300	1,737	85	11%	2,900,000	1,885,000	1,085	22,308	GWY	INDEP	1,033	26,714
1.b Saeftinghedock North (+ village of Doel)	1,834	300	2,134	111	11%	3,600,000	2,340,000	1,097	21,081	GWY	INDEP	1,033	26,714
13. Extension of Noordzeeterminal full	1,940	350	2,290	125	11%	3,600,000	2,340,000	1,022	18,720	GWY	INDEP	1,033	26,714
14. Ctr terminal @ Delwaidedok	2,220	150	2,370	155	11%	4,000,000	2,600,000	1,097	16,774	GWY	INDEP	1,033	26,714
15. ctr terminal 'Schaar van Ouden Doel'	1,450	300	1,750	111	11%	3,000,000	1,950,000	1,114	17,568	GWY	INDEP	1,033	26,714
16. Ctr terminal @ Verrebroekdok	1,800	350	2,150	142	11%	3,700,000	2,405,000	1,119	16,937	GWY	INDEP	1,033	26,714
4a. Riverterminal Northwest	1,400	150	1,550	78	54%	3,400,000	2,210,000	1,426	28,333	T/S	EXP	1,365	38,264
4b. Riverterminal Northwest limited	625	150	775	36	54%	1,700,000	1,105,000	1,426	30,694	T/S	EXP	1,365	38,264
5a. Waaslandkanaal/Doeldok optimized	660	450	1,110	35	54%	1,700,000	1,105,000	995	31,571	T/S	EXP	1,365	38,264
5b. Waaslandkanaal Noordelijk Insteekdok	500	150	650	62	11%	900,000	585,000	900	9,435	GWY	EXP	1,033	26,714
6. Ashland	-	420	420	23	11%	800,000	520,000	1,238	23,111	GWY	EXP	1,033	26,714
10. Extension of Europaterminal	1,100	300	1,400	40	11%	2,400,000	1,560,000	1,114	39,000	GWY	EXP	1,033	26,714
11. Extension of Noordzeeterminal optimized	500	-	500	34	11%	900,000	585,000	1,170	17,463	GWY	EXP	1,033	26,714
12. Extension of Noordzeeterminal limited	140	350	490	25	11%	700,000	455,000	929	18,571	GWY	EXP	1,033	26,714

Capacity review- High level operational review

High level operational review:

From an operational perspective,

- capacity expansion alternatives 1, 2 and 3 appear preferable to a terminal operator
- capacity expansion alternatives 6, 7 and 8 appear as the less attractive ones to a terminal operator

alternative	Hub	Land infrastructure	Offering	Flexibility	Nautical access	Project risk	Remarks	Score
1	+	-	+	+	+	o	expandable (+), clear offerings (+), project risk (delay) (-), heavy concentration of hubs at left bank (-).	
2	+	-	+	o	+	o	not expandable (Southside). Concentration of traffic on left bank (-)	
3	+	-	+	+	+	o	flexible (can be split or consolidated)(+), project risk (delay), concentration of traffic on left bank (-)	
4	+	+	+	o	o	+	expansion from existing terminals, ET no-hub function, AGW (optimising), separate planning. Hubs spread (+), spread of traffic in port (+), potential nautical issues	
5	+	+	+	+	o	+	expansion from existing terminals, separate planning, spread of hubs (+), spread of traffic in port (+), substantial increase in capacity (+), potential nautical issues	
6	-	+	-	-	-	-	no hub offering, scattered capacity (behind the locks) (--)	
7	-	+	-	-	-	-	hub offering behind locks	
8	-	+	-	-	-	-	relocation of Roro already concluded	

Section 3: Assessment of the building blocks from a market / commercial context

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Commercial assessment criteria

Given Drewry's view on the market context, developed in Section 1, the criteria which will determine the commercial success of the proposed terminal developments, are set by two market participants: terminal operators and shipping lines.

The terminal operator have to be willing to operate and bid favourably for concessions. In order to do so, they must reasonably anticipate sufficient demand, and have the prospect of being able to run a cost efficient operation that can be priced competitively and generate sufficient profit. The demand is generated by the shipping lines, while the efficient operation is, at least within the scope of this study, dependant on the terminal layout. Terminals expansion alternatives that result in terminal layouts that do not allow for efficient operations, will increase the distance that containers need to cover on the terminal, and thereby push up the operating costs. This negatively impacts the anticipated profits, and hence the willingness of terminal operator to bid favourably for concessions.

Shipping lines have developed a rigorous focus on cost. They minimise cost by focussing on efficiently running their vessels, on schedule, and reducing the terminal handling costs which have become the single largest cost element for some shipping lines. In order to efficiently run their vessels, on schedule, shipping lines require efficient vessel calls, minimising the time at port so the ships can maintain slow streaming in between ports. Terminal expansion alternatives that result in vessel calls behind locks are not efficient: they increase cost, take longer, reduce the flexibility for tidal-dependant voyages, and increase the risk of delays, all of which negatively impact the efficiency of the port call.

Drewry generally subscribes to the adage 'cargo is king' which implies we should also include the Shipper as an important decision maker in the cargo routing and hence the success of any terminal development. While that is generally true, it is fair to assume, within the scope of this study, that 1/ shipping lines offer commoditised services, 2/ terminal accessibility is equal for all terminals, and 3/ inland transportation cost (incl. the impact of congestion) is equal for all port terminals. Doing so, makes the Shippers indifferent regarding the terminal used in their cargo routing.

In our assessment overleaf, we have scored the 18 building blocks as '+' when they meet the current expectations of the decision makers, as 'o' when they do so in a sub-optimal manner, and as '-' when they do not meet the current expectations of the decision makers. The score of the alternative is then allocated based on the score of it's weakest building block.

Commercial assessment of the building blocks

alternative	Building block	Shipping line's criteria	Terminal operator's criteria	Remarks	Score
1	1aN	+	+	alternative 1 would meet the market requirements of shipping lines and terminal operators	
	1aS	+	+		
2	1bS	+	+	alternative 2 would meet the market requirements of shipping lines and terminal operators	
	1bS	+	+		
3	2	+	+	alternative 3 would meet the market requirements of shipping lines and terminal operators	
4	13	+	+	alternative 3 would meet the market requirements of shipping lines but building block 10 would create a shallow / narrow yard area which is sub-optimal for terminal operations.	
	10	+	0		
	6	n/a	n/a		
5	4a	+	0	alternative 4 would meet the market requirements of shipping lines but building block 4a would make the terminal 4.3 km long which is sub-optimal for terminal operations	
	13	+	+		
6	5a	-	-	In alternative 6, building block 11 would meet the requirements of shipping lines and terminal operators. Building blocks 5a ad 5b are behind locks, and therefor unattractive for shipping lines. These terminal expansions would also result in longer driving distances, which is sub-optimal for 5b, and negative for 5a because it is a transhipment terminal	
	5b	-	0		
	11	+	+		
7	4b	+	+	In alternative 7, building blocks 4b and 12 would meet the market requirements of shipping lines and terminal operators but building block 14, which would cater for 62% of the capacity, is situated behind locks and therefor not attractive for shipping lines.	
	12	+	+		
	14	-	+		
8	15	+	+	alternative 8 would meet the market requirements of shipping lines but building block 4a would make the terminal 4.3 km long which is sub-optimal for terminal operations	
	16	-	+		

Conclusions regarding the commercial assessment of the building blocks

- The alternatives that meet the current expectations of shipping lines and terminal operators, and hence offer the lowest risk from a commercial perspective, are alternatives 1, 2, and 3.

- The alternatives that sub-optimally meet the current expectations of shipping lines and terminal operators, and hence offer a higher risk from a commercial perspective, are alternatives 4 and 5.

- The alternatives that do not meet the current expectations of shipping lines and terminal operators, and hence offer the highest risk from a commercial perspective, are alternatives 6, 7, and 8.

Appendix:

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Limitations of the study

Limitations of the review

- Drewry has had no access to the excel model containing the capacity calculations or any model simulation materials It is out of the scope of Drewry's review to review the calculations.
- Performance benchmarks are not a methodology to calculate terminal capacity as it is far from an accurate approach. The present review is based on benchmarks only because its purpose is to assess reasonableness of the capacity proposed by TBA for the various alternatives
- Drewry's benchmarks related to "average utilisation" of the terminal. The sample contains terminals of different utilisation levels. Within the final sample of 301 terminals, there are under-utilised terminals or new ones that are ramping up. In these cases the infrastructure available is well above what is required for the current low volumes. As a consequence these terminals will show low productivity figures and bring down the overall averages.
- Drewry has divided the 301 terminals in Gateway and Transhipment however this may not represent the predominant traffic type due to the following reasons:
    - A port may handle significant transhipment in terms of teu numbers, but as a proportion of the total terminal throughput, transhipment may not be the main traffic type (For example Rotterdam).
    - Drewry has access to estimates of transhipment incidence at port level, but not at terminal level, and sometimes just one terminal in a port handles the majority of the port's transhipment .
- Drewry has divided the 301 terminals in Gateway and Transhipment however the "Transhipment" terminals have very different transhipment incidences. Drewry has obtained averages but aggregating transhipment terminals with 70% transhipment and others with 20% transhipment.
- Not all the terminals of the sample use the same concept of "area". In some cases the storage yard area is TBA reported whereas in others the total port area is considered. This results in variations across the average productivities.
- The TEU per Ha performance metric does not reflect the use of different types of yard operation equipment (ASC operation results in higher yard area productivity than reach stacker)
- The TEU per Ha performance metric does not reflect the typical stacking height at the yard operation equipment (higher stacking heights result in higher yard area productivity)
- Some terminals have very high TEU per Ha productivity due to off-dock storage (containers evacuated from the marine terminal quickly).
- The capacity analysis focuses on civil infrastructure provided (quay and yard) and excludes the yard and quay equipment from the assessment therefore assuming that equipment will not be the capacity limiting factor.

Summary of alternatives

Summary of alternatives

1. Saeftinghedock

Extra container handling capacity

	Saeftinghedock North (1a-N)	Saeftinghedock South (1a-Z)
Deepsea quay	1437m (depth -18m LAT)	1400m (depth -18m LAT)
Dedicated barge quay	300m	300m
Terminal area	84,3ha	104,1ha
Capacity (maritime + barge)	2,9 mio TEU (import/export terminal)	3,7 mio TEU (transshipment hub)

6,6 mio

Multimodal access

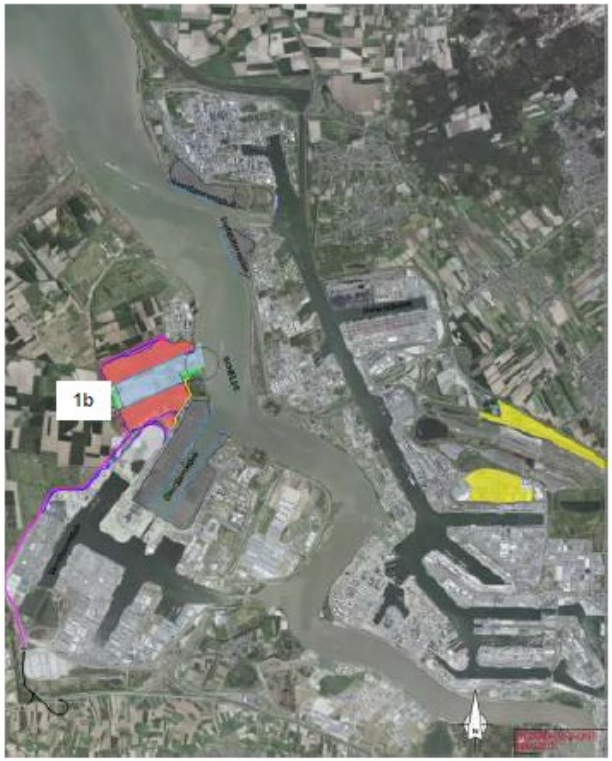
Rail access

Road access

13

Summary of alternatives

2. Saeftinghedock while preserving Doel



Extra container handling capacity

	Saeftinghedock North (1b-N)	Saeftinghedock South (1b-Z)
Deepsea quay	1834m (depth -18m LAT)	1400m (depth -18m LAT)
Dedicated Barge quay	300m	150m
Terminal area	111ha	107,1ha
Capacity (maritime + barge)	3,6 mio TEU (import/export terminal)	3,4 mio TEU (transshipment hub)

7,0 mio

Multimodal access

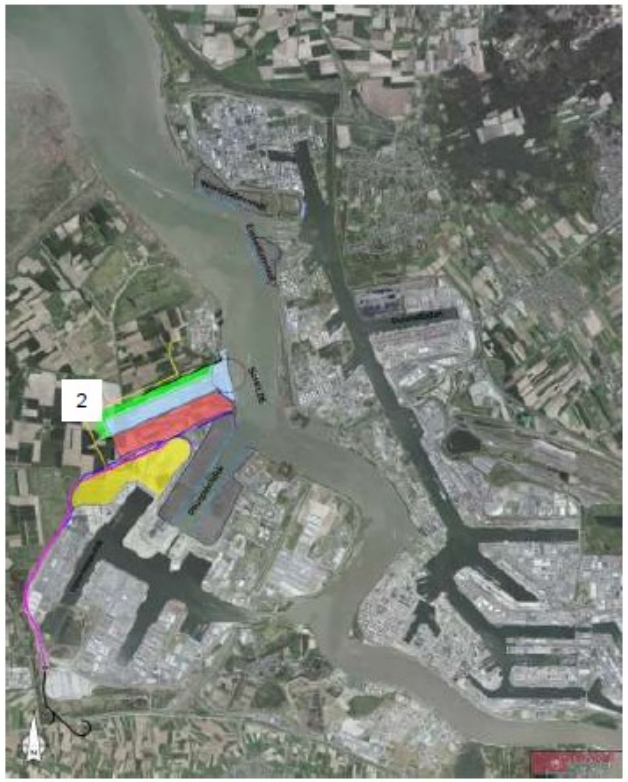
Rail access

Road access

15

Summary of alternatives

3. Saeftinghedock only South side



Extra container handling capacity

	Saeftinghedock South (2)
Deepsea quay	2750m (depth -18m LAT)
Dedicated barge quay	300m
Terminal area	171ha
Capacity (maritime + barge)	6,6 mio TEU (transshipment hub)

Multimodal access

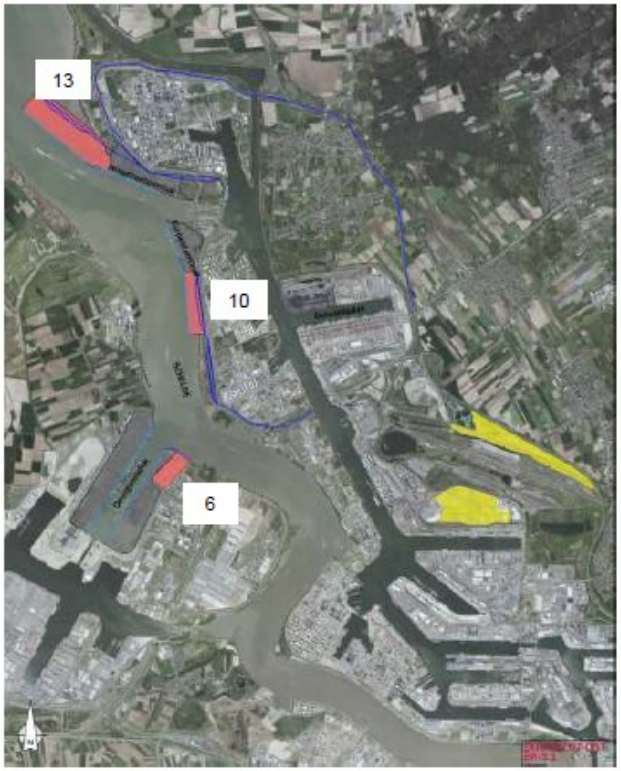
Rail access

Road access

17

Summary of alternatives

4. Expansion Noordzeeterminal, expansion Europaterminal & expansion Deurganckdock East



Extra container handling capacity

	Noordzee terminal (13)	Europa terminal (10)	DGD East (6)
Deepsea	+1940m (d -18m LAT)	+1100m (d -18m LAT)	+0m
Dedicated barge	+350m	+300m	+495m
Terminal area	+125ha	+39,9ha	+22,5ha
Capacity (maritime + barge)	+3,7 mio TEU (import/export terminal)	+2,3 mio TEU (import/export terminal)	+0,7 mio TEU (import/export terminal)

Multimodal access

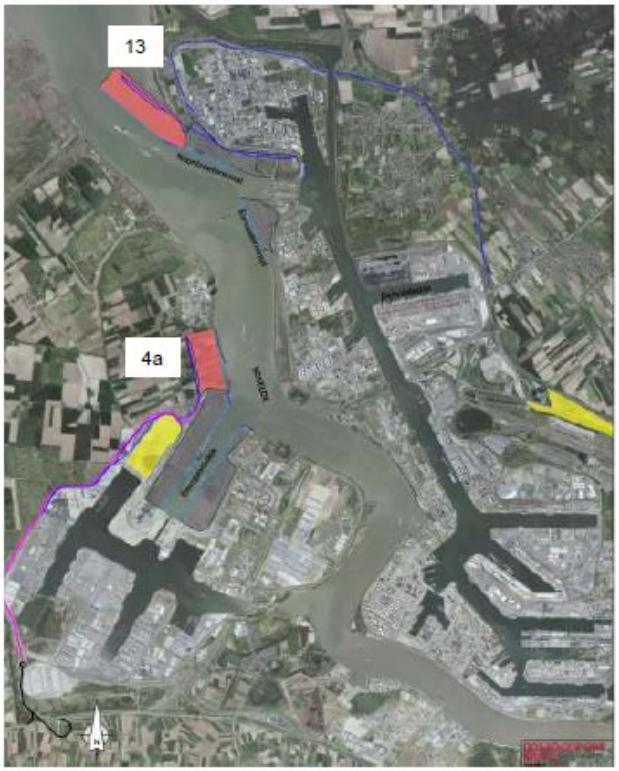
Rail access

Road access

19

Summary of alternatives

5. Expansion Noordzeeterminal & container quay NW of Deurganckdock



Extra container handling capacity

	Noordzee terminal (13)	Container quay NW (4a)
Deepsea quay	+1940m (depth -18m LAT)	+1400m (depth -18m LAT)
Dedicated Barge quay	+350m	+150m
Terminal area	+125ha	+78ha
Capacity (maritime + barge)	+3,7 mio TEU (import/export terminal)	3,4 mio TEU (transshipment hub)

7,1 mio

Multimodal access

Rail access

Road access

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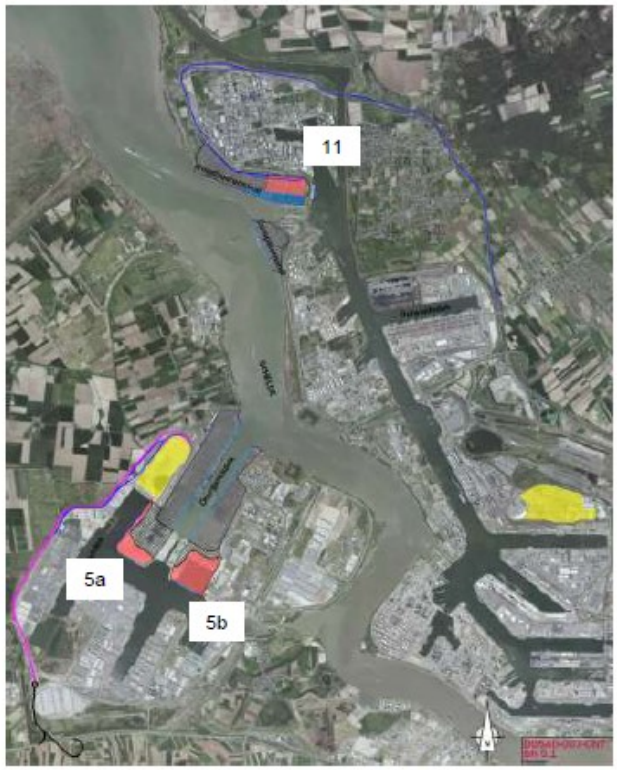
Summary of alternatives

6. Expansion along Waasland canal & NID (insertion dock North of Zandvlietlock)



Extra container handling capacity

	Noordzee terminal (11)	DGD West (5a)	DGD East (5b)
Deepsea	+1250m (d -18m LAT)	+660m (d-14,5m TAW)	+500m (d-14,5m TAW)
Dedicated barge	+150m	+1050m	+150
Terminal area	+33,5ha	+35ha	+62,3ha
Capacity (maritime + barge)	+2,1 mio TEU (import/export terminal)	+3,7 mio TEU (*) (transshipment hub)	+1,1 mio TEU (*) (import/export terminal)

6,9 mio

Multimodal access

Rail access

Road access

(*) To recalculate depending on result operationality investigation

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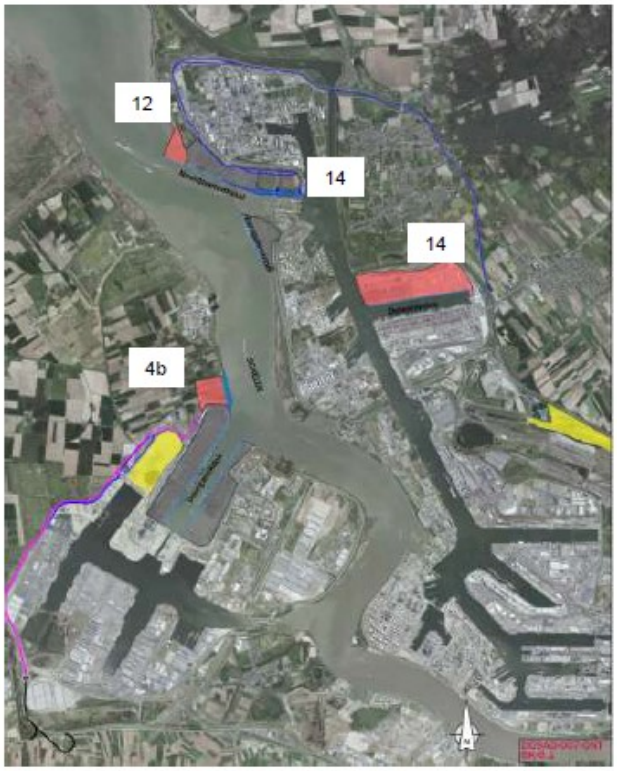
Summary of alternatives

7. Limited expansion Noordzeeterminal, Delwaidedock i.c.w. new sealock & narrowed container quay NW of Deurganckdock



Extra container handling capacity

	Noordzee terminal (12)	Delwaidedock With extra lock (14)	DGD West (4b)
Deepsea	+140m (d -18m LAT)	+2220m	+625m (d -18m LAT)
Dedicated barge	+350m	+150m	+150m
Terminal area	+24,6ha	+154,8ha	+36ha
Capacity (maritime + barge)	+0,7 mio TEU (import/export terminal)	+4,0 mio TEU (import/ export terminal) 6,4 mio	+1,7 mio TEU (transshipment hub)

Multimodal access

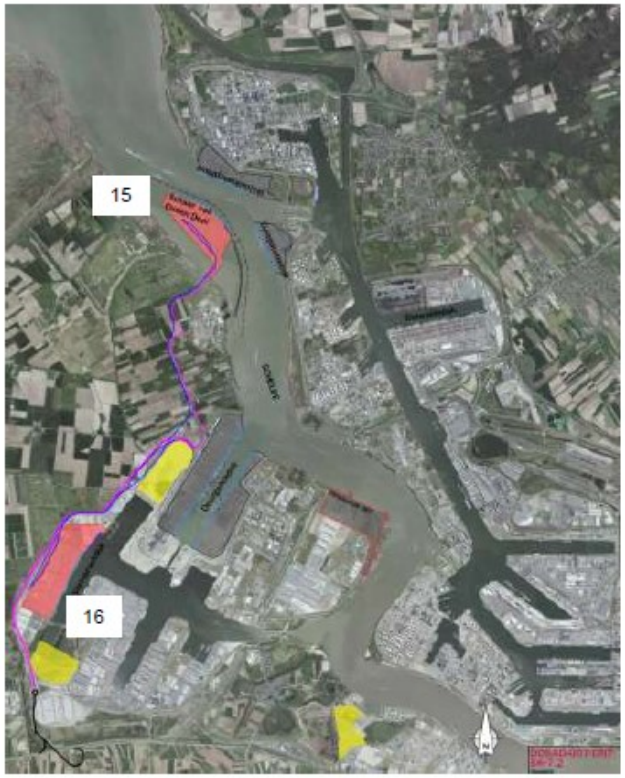
Rial access

Road access

29

Summary of alternatives

8. Schaar van Ouden Doel, West side Verrebroekdock RoRo upstream of Liefkenshoektunnel



Extra container handling capacity

	Schaar van Ouden Doel (15)	Verrebroekdock (16)
Deepsea quay	1450m (depth -18m LAT)	1600m (depth -14,5m TAW)
Dedicated barge quay	300m	560m
Terminal area	111ha	142ha
Capacity (maritime + barge)	2,9 mio TEU (import/export terminal)	3,7 mio TEU (import/ export terminal)

Multimodal access

Rail access

Road access

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