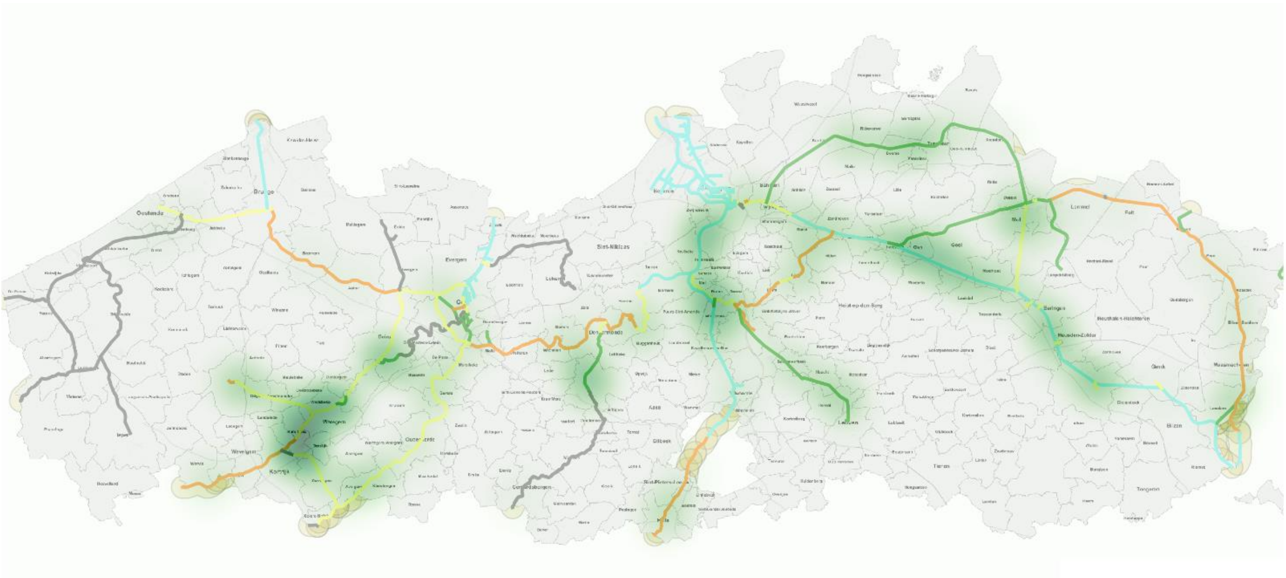
GIS [1]study
industrial estates with water-dependent activities
&
public quay walls

Final report



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[1] Geographical Information Systems

Table of contents

EXECUTIVE SUMMARY

Businesses increasingly find themselves faced with the adverse implications of traffic congestion and the increasing paucity of space to conduct their operational activities. The latter is just one of the findings to emerge from the Inland Shipping 2.0 study.

How can De Vlaamse Waterweg assume its societal responsibility to the full by acting in a(n) (even) better and more targeted response to market expectations? How can De Vlaamse Waterweg contribute to enhanced mobility?

This broadly sketched social background served as the impetus to set up a study that provides insights into issues such as:

- Which industrial estates that are located by the waterways have transhipment infrastructure and actively use this infrastructure?
- How does the network of public quay walls operate? Can this network be improved? Is there a need for additional public quay walls?

The study was performed in a GIS environment. The GIS analysis identified 496 industrial estates that are located by a navigable waterway. Just 1 in 3 of these estates have a link-up with the waterway, although it should be noted that this group of 157 estates does represent 60% of the total surface area of industrial estates bordering waterways.

De Vlaamse Waterweg manages 42 public quay walls, many of which are situated along the Maritime Canal and the Brussels-Charleroi Canal. Their utility varies greatly. Some have fallen into disuse, others may be reactivated provided specific interventions are carried out and a number of them are successfully used for goods transhipment activities. Around 40% of these quay walls are located in an industrial estate, the remaining 60% are not.

Thanks to the know-how gleaned through this study, we are able to bring specific and duly underpinned answers to questions such as:

- Which estates with transhipment infrastructure can be used more efficiently, both in terms of the number of businesses that use the infrastructure and in terms of the proportionate land take rate of the total estate surface area?
- Which non-water-dependent estates need to be equipped with transhipment infrastructure as a matter of priority?
- Which estates, both water-dependent and non-water-dependent, can play a part in a specific future development – ENA[2], ENES[3], Distribouw, earthworks, etc.
- How can estates with substantial water-dependent activities shape transport regions and regional logistics hubs?
- How do we deal with the existing public quay walls in times to come? Which quay walls would do well out of being reactivated? What is the intended spatial spread of the public quay walls?
- Should the existing network of public quay walls be expanded? If so, based on which vision development?
- This study can also serve in support of a targeted land acquisition policy, e.g. as part of the expansion of a water-dependent industrial estate.

[2] Albert Canal Economic Network

[3] Seine-Scheldt Economic Network

Many of the topics presented in this summary are also featured in the action plan of the Inland Shipping 2.0. study for that matter:

- A_I.04: devising a widely supported vision and action plan at Flemish level for the relocation of businesses that have not yet taken to embracing the waterways as part of their operations, but which are located at water-dependent industrial estates;
- A_I.05: focusing on a higher uptake rate of under-used PPP and public quay walls;
- A_I.08: the communication and operationalisation of the small inland waterways action plan;
- A_BD.01: continued support for businesses to effectively take to using inland waterway shipping by performing potential analyses for goods flows which could be useful for inland shipping;
- A_BD.02: updating the Masterplan 2020 for new/multimodal transhipment infrastructure and technology in Flanders.

As such, the present report can be used as a source to further flesh out the action plan set out in Inland Shipping 2.0.

This study can also be used as input for European projects like IWTS 2.0 (Inland Waterways Transport Solutions), a European Interreg project promoting inland navigation on a European scale.

Lastly, this study may prove to be of substantial added value for water-dependent projects and assignments, especially when combined with studies or models such as Inland Shipping 2.0, Distribouw, earthworks, the LAMBIT[4]model, Transport-Bis, etc.

[4] Location Analysis Model for Belgian Intermodal Terminals, developed by the Vrije Universiteit Brussel

LIST OF ABBREVIATIONS

BTMO: Industrial estates with transhipment infrastructure [Bedrijventerrein Met Overslaginfrastructuur]
BTZO: Industrial estates without transhipment infrastructure [Bedrijventerrein Zonder Overslaginfrastructuur]
CEMT- class: classification of waterways according to the European Conference of Transport Ministers 1992
DVW: Flemish Waterways plc (De Vlaamse Waterweg NV)
ENA: Albert Canal Economic Network [Economisch Netwerk Albertkanaal]
ENES: Seine-Scheldt Economic Network [Economisch Netwerk Seine-Schelde]
FRISbi: Flanders RIS (River Information System) business intelligence
GIS: Geographical Information Systems
Lambit: Location Analysis Model for Belgian Intermodal Terminals
MER: Environmental Effects Report [Milieu Effecten Rapport]
MOBER: Mobility Effects Report [Mobiliteits Effecten Rapport]
NSTR: Classification of goods – Uniform nomenclature of goods for transport statistics, revised
RIS: River Information System
ROC: Regional Transhipment Centre [Regionaal Overslag Centrum]
TEU: Twenty Equivalent Unit
VLAIO: Flanders Innovation & Entrepreneurship Agency [Vlaams Agentschap voor Innoveren en Ondernemen]

1 INTRODUCTION

1.1 Background

1.1.1 Societal context

The mobility issue is increasingly becoming a matter of prime concern. Traffic queue records are being broken in increasingly quicker succession[...]. Traffic congestion has a suffocating impact on our economy. It casts a shadow on our quality of life. A wide number of measures have been implemented to call a halt to congestion and to improve the quality of the road environment. In spite of these efforts, congestion levels are continuing to steadily rise.

Also, there is increasingly a view that there is a dire lack of space in Flanders, with the various actors vying for space, including housing, work, open space, etc., showing little understanding for one another. It is becoming an increasingly challenging to commit the scarce amount of space that is available for the objective pursued in a way that is both smart and purposeful.

The Flemish world of trade and industry is not only grappling with local sore points such as mobility and the lack of space, it also needs to be equipped to deal with a globalised economy. This is possible only if the enabling conditions make it appealing to invest and do business in Flanders.

In this regard, De Vlaamse Waterweg must and should assume societal responsibility. First and foremost by working towards a maximum uptake of the waterways as a means of transporting goods. This needs to be associated with a duly considered and underpinned spatial policy. If the intention is to sustainably embed the presence of trade and industry in Flanders, we will need to offer quality estates that also allow for water-dependent activities to develop without obstacles being put in the way. So as not to needlessly take up the scarce open space, an economic and optimised use of the available space is advisable more than ever (cfr. Actiepunt A_I.04 van Binnenvaart 2.0).

1.1.2 Industrial estates with water-dependent potential

Bearing in mind this societal framework limned in broad outlines, the Commercial Management department at De Vlaamse Waterweg has a concrete need for insights into water-dependent activities in the world of trade and industry. These insights manifest themselves in queries such as:

- which industrial estates are located by navigable waterways?
- which of these industrial estates have a link-up with the waterway?
- which of these industrial estates actively use this link-up; i.e. effect transhipment tonnages?

As the insights sought involve both a quantitative and a spatial component, this study was conducted using a GIS application.

In addition to obtaining insights into the existing water-dependent offering (both estates and transhipment infrastructure), in a second step, these research efforts may be used to take a duly underpinned approach to industrial estates that either make no or only limited use of the link-up infrastructure that is in place, or that do not yet have a water-dependent link-up. In doing so, extra goods flows could be lured to the waterways.

1.1.3 Public quay walls

Independently of the above, on the initiative of a working group on quay walls (of the former Waterwegen en Zeekanaal NV) it was proposed to chart the potential of the existing public quay walls. This question was prompted by the fact that the unbridled addition of quay walls to the existing infrastructure is neither financially nor spatially desirable, despite the fact that a PPP arrangement exists for the construction of loading and unloading facilities.

After all, it would be no more than logical to first ask oneself whether the existing infrastructure can be used to more efficient effect before considering additional infrastructure. To do so, two avenues are open to us that are worth exploring.

The first of which is to encourage the shared use of private quays, even though this option is feasible only if the businesses concerned are prepared to get behind the idea, and where it is practically achievable to ensure the smooth-paced mutual alignment of the goods flows and logistical operations of both parties. This option may be accomplished by way of financial incentives, or by assigning comparatively greater weight to the tonnages of third parties in the assessment of the total tonnage commitment[5], for instance.

The second avenue is to encourage the use of public quays. Public quays are loading and unloading installations available to by private companies for transshipment purposes under the terms of an agreement or a licence. To date, the emphasis in putting in place the transhipment infrastructure particularly rested with the construction of quay walls as part of the PPP arrangement. However, public quay walls may act as a worthy alternative, especially for businesses who do not wish to use the waterways quite that intensively.

To map out the potentials of the public quay walls, we also used the GIS application referenced above.

1.1.4 Expected added value of this study

The underlying core philosophy of this study is the societal role of the waterway manager in the use of space, mobility, and the economic cementation that follows on from this. How do we acting in (even) better and more targeted response to demand from the market? How do we suitably act in anticipation of future developments? How do we contribute to enhanced mobility?

From this angle, this study is expected to deliver the following added value:

1) Inventory of estates with water-dependent potential, in terms of:
    - numbers;
    - locations;

[5] In the event the company is bound by a tonnage commitment as part of a concession agreement or a PPP arrangement

- surface areas;
- transhipment tonnages;

which will enable us to bring answers with full knowledge of the facts to queries such as:

- ⇨ To what extend does this existing offering of water-dependent infrastructure meet the requirements of future spatial developments?
- ⇨ Which non-water-dependent estates can be committed to meet future developments such as ENA, ENES, Distribouw, etc.?
- ⇨ Which water-dependent estates can be used to more optimum effect by way of targeted schemes such as estate compaction, more intensive use of the transhipment infrastructure, attracting new water-dependent activities, etc.
- ⇨ Are there opportunities to increase access to the waterways for second and third-line water-dependent businesses through shared use?

2) Inventory of public quay walls, in terms of:
    - numbers;
    - locations;
    - transhipment tonnages;

which will enable us to bring answers with full knowledge of the facts to queries such as:

- ⇨ Which public quay walls can be used to more optimum effect by nearby businesses?
- ⇨ Is there a need for extra public quay walls? If so, where?
- ⇨ How can public quay walls raise accessibility to the waterways for second and third-line water-dependent businesses?

3) Based on the existing water-dependent industrial estates, which criteria enable us to select non-water-dependent estates which, in our view, merit priority action for a water-dependent link-up? Examples include the size of the industrial estates, the type of waterway where these estates are situated, the location, the designated purpose in the regional land use plan, etc.

4) This study can also offer scope to support a targeted land acquisition policy, e.g. as part of the expansion of water-dependent industrial estates.

5) Linkage with other studies, with a view to the creation of synergies. The first and foremost includes the action plan of Inland Shipping 2.0 , as well as the Mineral Resources study, and the LAMBIT[6]model devised by MOBI[7]. This study could also serve to highlight the role of inland water transport in the context of transport regions and regional logistics hubs.

6) In parallel therewith, results of this GIS-study can also be serviceably used in as part of MERs[8] and MOBERs[9], for which key data are required to determine and assess the impact of the cargo traffic.

[6] Location Analysis Model for Belgian Intermodal Terminals

[7] Mobility, Logistics and Automotive Technology Research Centre (VUB)

[8] Environmental Impact Assessment Report

[9] Mobility Impact Assessment Reports

1.2 Scope

The present study covers two topics.

The first topic deals with the industrial estates located by a navigable waterway. The idea is to determine for these estates which of them have a waterway link-up. The industrial estates that have a water-dependent link-up are to be assigned a transhipment tonnage. For the industrial estates that do not have a waterway link-up, criteria are being examined which can help us to establish how these estates may contribute to water-dependent developments.

The second topic dilates on the public quays, whereby an inventory is compiled of the existing public quays and their annual transhipment tonnage. Based on this information, and combined with the data obtained via the “industrial estates with water-dependent link-up” topic, criteria are explored which may help to determine how the network of public quays may be optimised.

The reason why these two seemingly different topics, i.e. industrial estates with water-dependent link-up and public quay walls are dealt with in one and the same study, is twofold. To begin with, the same GIS environment and source data are used for both topics, and the industrial estates and the public quays alike are assigned a transhipment tonnage. Alongside one and the same study environment, this approach also comes with a substantive added value, in that water-dependent industrial estates and public quays can be mutually complementary and reinforce each other in working up a diversified offering of water-dependent potentials. By way of an example, in case of a lack of water-dependent industrial estates in a given region, building public quay can bring genuine added value in terms of the local mobility as well as serving local businesses.

1.3 Reading guide

The next chapter (2) sets out the methodology and the GIS application for the industrial estates as well as the public quays. This is followed by a discussion of the results (chapter 3). Chapter four dilates on the criteria that may be used in the approach to non-water-dependent industrial estates and the optimisation of the public quay walls, after which the report is brought to a close with a conclusion (chapter 5).

This study is based on figures from 2018.

2 METHODOLOGY

The present study adopts a three-step approach:

Step 1: the performance of a GIS analysis in order to identify the industrial estates which do or do not have transhipment infrastructure, as well as the public quays;

Step 2: the assignment of transhipment tonnages to industrial estates with transhipment infrastructure and the public quays;

Step 3: visualisation of the results;

Step 4: discussion of criteria to establish:

- for which industrial estates without transhipment infrastructure a future water-dependent link-up delivers added value;
- the optimisation of the network of public quays.

This chapter discusses steps 1, 2 and 3. The fourth step is reviewed in chapter 4.

2.1 Step 1: GIS analysis

2.1.1 Methodology for industrial estates situated along navigable waterways

A GIS environment not only enables us to visualise data with a spatial component, but also allows for analyses in which different map layers interact.

For the present study, the open source GIS software suite Q-GIS is used.

The following map layers are used:

- GRB (Large-scale Reference File): topographical background map (2018);
- industrial estates (source: VLAIO - Vlaams Agentschap voor Innoveren en Ondernemen [Flanders Innovation & Entrepreneurship Agency], 2018);
  These are the estates (earmarked according to regional plans, Special Zoning Plan - BPAs, and Spatial Implementation Plans - RUPs) as they actually exist.
- Flemish waterways from the VISURIS GDB file (2018);
- Terminals (source: Vlaamse Waterweg 2018).

Please note: the sea port area is located outside of the operating territory of De Vlaamse Waterweg NV and is not included in this study.

The following algorithm is used to ascertain which industrial estates are or are not linked to a waterway:

1) Selection of all industrial estates situated within a 2 km radius of a navigable waterway. These estates are not necessarily water-dependent, but these estates can be assumed to have a certain connection to, or affinity with, the waterway.

These estates can for example be used in the follow-up process to develop third-line water-dependent activities.

2) Selection of all industrial estates of (1) adjacent to a navigable waterway. It can be assumed that these estates have the potential for a water-dependent link-up A distance of 150m was used as a criterion. This distance was empirically determined and takes into account the fact that the GIS data of a waterway is a line representing the fairway. Too small a distance will therefore overlook estates adjacent to waterways in those higher CEMT categories, particularly when it comes to tidal rivers such as the Zeeschelde.

3) Selection of all industrial estates of (2) with direct access to a quay wall. A search radius of 50 m was set for this purpose. All estates within a search radius of 50m of a quay wall are selected. These estates are given the "with transhipment infrastructure" label in the study (BTMO).

   This 50m radius was empirically determined. Too small a search radius overlooks industrial estates that are separated from the quay wall by a road or a wide grass verge. If the search radius is too big there is a risk that a quay wall located on the opposite bank of a small waterway will be erroneously assigned to the industrial estate.

4) Selection of all industrial estates of (2) adjacent to a navigable waterway but without direct access to a quay wall. The same search radius of 50m from step 3 was used here. These estates are given the "without transhipment infrastructure" label in the study (BTZO).

5) For the industrial estates without transhipment infrastructure (4) a final step can be used to determine which spatial planning has been assigned to them by the regional land use plan. The zoning of the regional land use plan can be used as a criterion in the prioritisation of the estates that are to be given a waterway link-up in the future. This aspect will only be discussed in the follow-up process (chapter 4).

2.1.2 Public quay walls methodology

The attribute table of the map layer of the terminals contains the attribute "function", which describes the type of quay wall (bulk, container, public). This attribute can be used to distinguish public quay walls from others.

2.1.3 Advantages and limitations of this method

A GIS analysis enables the uniform application of the desired analysis to a large quantity of spatial data, and the combination of data from different (map) files. Moreover, the results can be displayed in both map form and in table form.

Manual corrections and adjustments were however required. For example, it appears that some transhipment infrastructure such as pipelines or suction systems, sometimes located far inland, fall outside the 50m search radius of an industrial estate, from which it could be deduced that the estate is non-water-dependent. This is also possible if a wide road or verge (>50m) has been built between the quay and the estate.

Some industrial estates functionally form one contiguous area, although they are separated from each other administratively by a different numbering. They are therefore regarded as separate spatial objects in the GIS analysis, which may result in one estate being labelled as having transhipment infrastructure and the neighbouring estate as not having transhipment infrastructure, even though they functionally form a single entity. Therefore, the interpretation of the results requires a certain level of pragmatism, as well as an additional field visit in order to avoid drawing premature conclusions.

The map layer with the industrial estates contains all the plots in the regional land plan, the Special Zoning Plan and the spatial implementation plans with an economic use, regardless of the subdivision into industrial estate, regional industrial estate, retail area, etc.) It is therefore possible that industrial estates located along the waterway are selected in this study, but are not eligible for water-dependent activities.

An industrial estate is assigned the label "BTMO" (Industrial Estate with Transhipment Infrastructure) once transhipment infrastructure is detected within a search radius of 50m. This study does not however take into account the functional use of the industrial estate, i.e. the proportion of businesses present there that actually use this infrastructure. It is therefore possible that only one of the companies present effectively makes use of inland navigation.

This study also does not allow any pronouncements on second- or third-line water-dependency, because we do not know, respectively, how an estate is used and who is still making use of the transhipment infrastructure in addition to the companies on that estate.

The map layer displaying the terminals contains neither technical information about the quay wall (length, surface, type, etc.), nor information about the condition of the quay wall.

Finally, generally speaking, the quality of the results obviously depends to a large extent on the accuracy and correctness of the source files.

2.2 Step 2: Assignment of tonnages

Upon identification of the water-dependent estates (BTMO's) a transhipment tonnage is assigned to each of these estates that make active use of the transhipment infrastructure. To this end, use is predominantly made of FRISbi, which stands for Flanders RIS (River Information System) business intelligence. This DVW tool for traffic figures was launched in 2019 and allows, among other things, information to be obtained on loading and unloading activities at three different levels (fairway - sailing segment - quay wall). A navigation segment is essentially a piece of a waterway. Segments are defined and numbered in the RIS. One segment may contain one, multiple or no quay walls.

Traffic figures for 2018 were used. The tonnages were assigned on the basis of the navigation segment where possible. If this turned out to be impossible (e.g. in the case of multiple estates on a navigation segment), a greater level of detail (quay walls) was added.

The assignment of tonnages had to be done manually, given that there is rarely an unambiguous correspondence between industrial estate and segment. For example, some segments contain several estates, while some very large industrial estates extend over multiple segments.

This tool uses data collected by the RIS. It is important to note that the RIS does not currently record transhipment activities in fairway stretches that do not pass through a lock. This explains why tonnages could not be assigned to estates located on the Lower Zeeschelde (municipalities of Schelle, Kruibeke, Hemiksem, Hoboken, Zwijndrecht). There may also be estates, more specifically along the Upper Zeeschelde) where the tonnage has been underestimated as a result of this (e.g. Briel te Baasrode estate).

For verification purposes, these data were compared to tonnages reported by companies to DVW in the context of concessions, PPS quay walls or support measures.

This study makes no distinction at product level (NSTR[10] codes).

Here, too, the algorithm does not allow any pronouncements on second- and third-line water-dependency.

The transhipment values were manually added to the GIS attribution table of the industrial estates with transhipment infrastructure. Although there is a large variation of transhipment values, ranging from 0 to almost 4 million tonnes, it was deliberately chosen to display these in only five categories:

- Category 1: 0
- Category 2: 1,000 to 100,000 tonnes
- Category 3: 100,001 – 500,000 tonnes
- Category 4: 500,001 – 1,000,000 tonnes
- Category 5: 1,000,001 – 3,800,000 tonnes

There are various reasons for this:

- Excessively detailed tonnage information could be interpreted as a breach of confidentiality.
- The transhipment values were determined on the basis of 2018 data. Tonnages are however subject to macro- and micro-economic fluctuations and evolutions. These tonnages can therefore be regarded as a snapshot. While using a longer time period may provide a more reliable picture, it proved too time-consuming at this stage of the study. A longer time period would offer added value, provided that this process can be automated.
- Most companies express their transhipment activity in tonnes. Some use m³ and container terminals use TEU's[11]. Others use project cargo (transport of large indivisible pieces). This complicates interpretation of the data, particularly as FRISbi does not allow these nuances to be taken into account. Everything was therefore expressed in tonnes[12].
- The RIS[13] only records cargo that passes through locks. Transhipment values for industrial estates located on, for example, the Zeeschelde and which are supplied by the port of Antwerp, are therefore not recorded (unless a certain tonnage has been declared as part of the concession).
- The accuracy of the transhipment values depends to a large extent on the accuracy of the basic data entered. These proved to not always be reliable (errors or inaccuracies in the assignment of cargo to a segment, etc.)
- Finally, unambiguously assigning a segment tonnage to an estate proved to be impossible.

FRISbi was also used to assign tonnages to public quays. This was easy, given that the tool allows for the retrieval of information at quay wall level for a given segment.

2.2.1 Determination of future potential

It is important to note that at this stage of the GIS study this concerns the assignment of realised tonnages and not potential or future tonnages. In order to be able to make an estimation of future tonnage potential or the

[10]Classification of goods – Uniform nomenclature of goods for transport statistics, revised
[11] Twenty Equivalent Unit
[12] For the containers, the tonnage was approximated by multiplying the number of containers by 25 tonnes (= net cargo) and then dividing it by two (full + empty).
[13] River Information Systems

tonnage potential of a non water-dependent estate, a combination of different sources appears to be most appropriate; the extrapolation of the data from this study is an example of this. We will return to this in chapter 4.5.

2.3 Step 3: Visualisation

The GIS tool enables the spatial and tabular visualisation of the results, in both analogue and digital form (via Intranet GIS).

3 DISCUSSION

3.1 Industrial estates with and without transhipment infrastructure

3.1.1 GIS analysis

All the steps of the algorithm are reviewed and illustrated here with the map layers used.

Vlaamse Vaarwegen

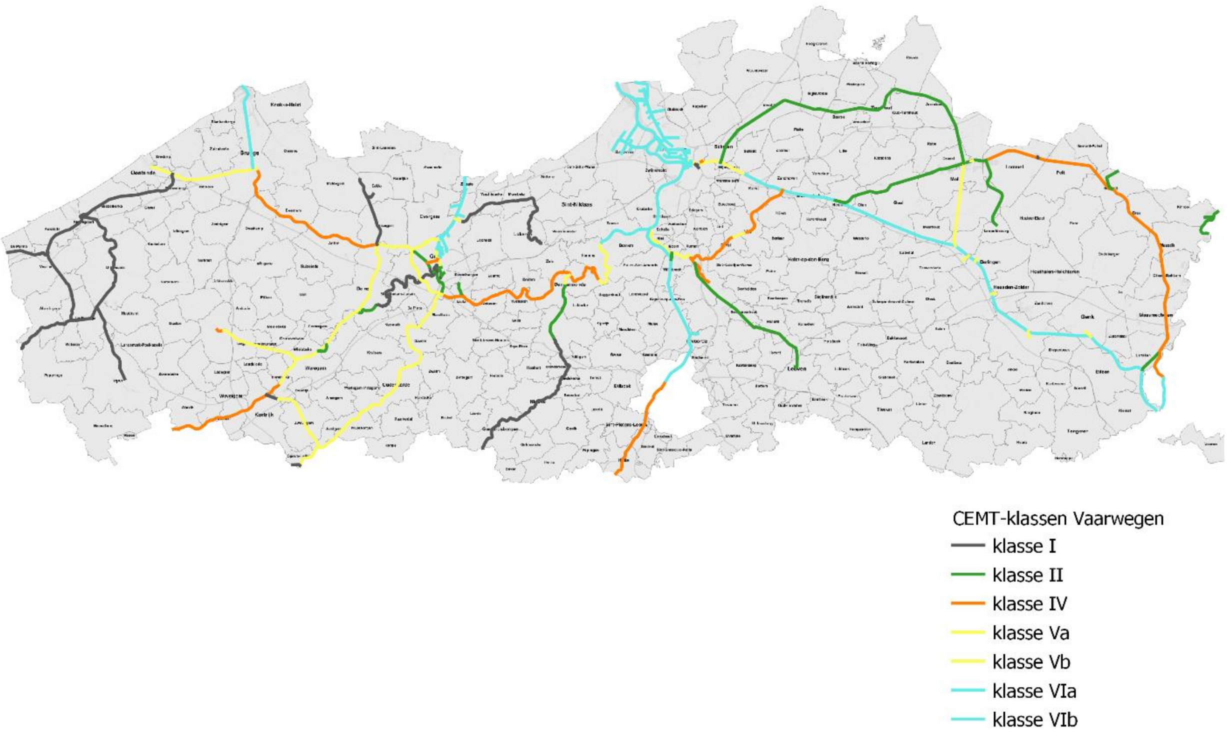


Figure1: Vlaamse vaarwegen [Flemish waterways]

Flanders industrial estates

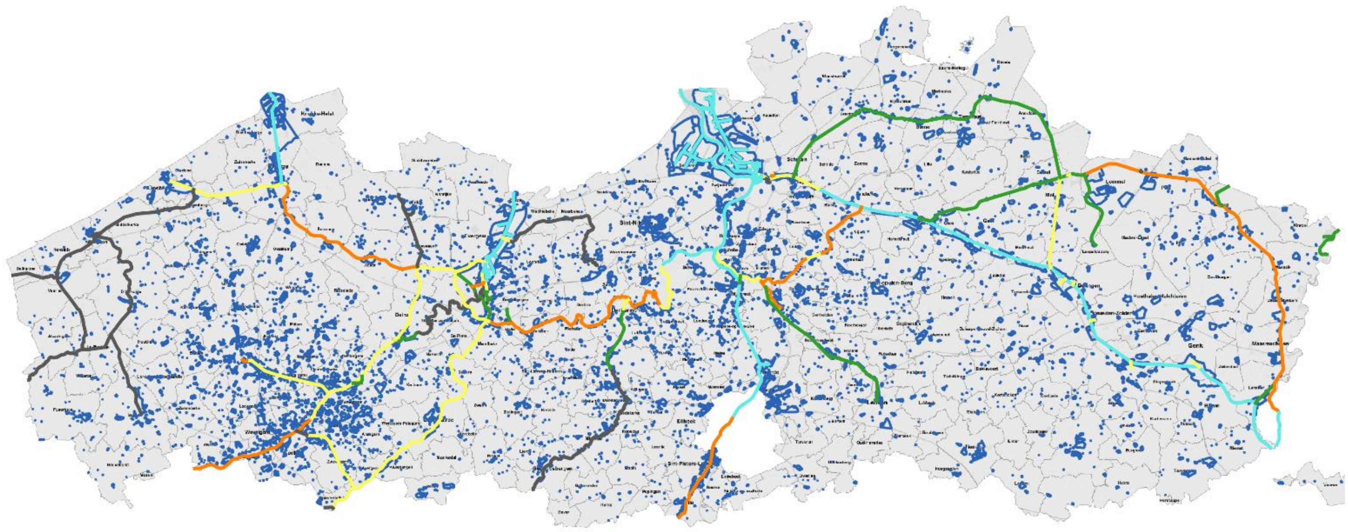


Figure2: Industrial estates in Flanders (outlined in blue)

According to VLAIO, Flanders has a total of 6,012 industrial estates[14], with a total surface area of 66,107ha. The average surface area per estate is approx. 11ha. The port areas are by far the largest estates.

Industrial estates located 2km from a waterway

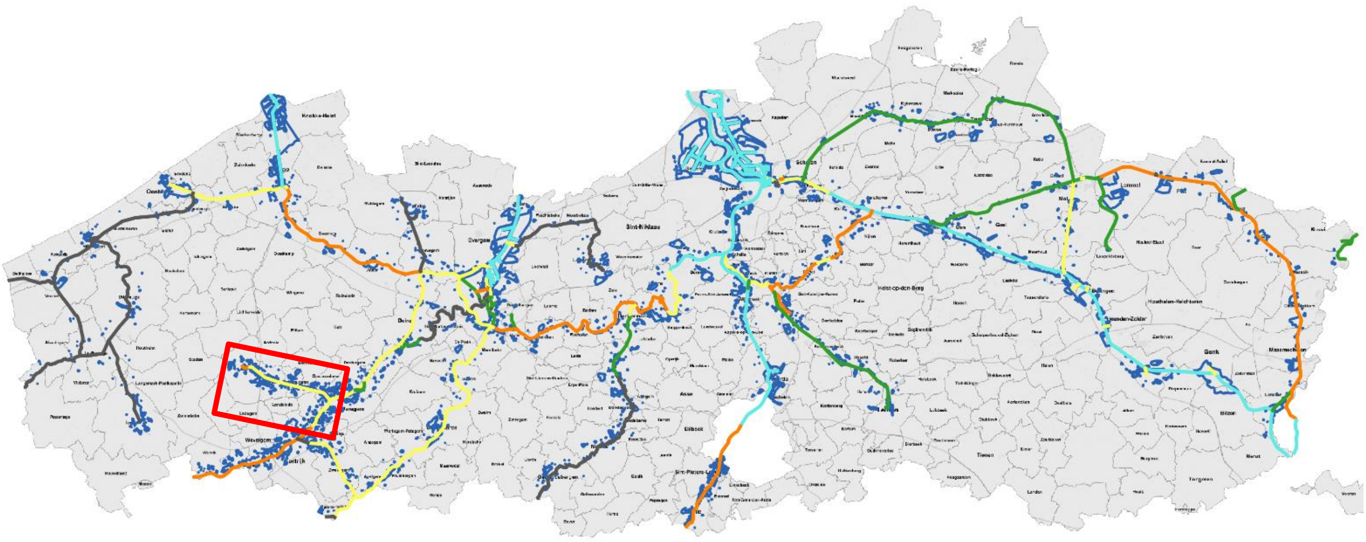


Figure3: Industrial estates situated within a 2 km radius of a navigable waterway.

[14] Source: VLAIO - Vlaams Agentschap voor Innoveren en Ondernemen [Flanders Innovation & Entrepreneurship Agency]

A total of 2,255 estates were selected. The total surface area of these estates is 45,000ha. The average surface area per estate is approx. 20ha.

We can deduce from this that a considerable part of Flemish industrial estate surface area is located near a waterway: 37.5% of the number of estates and no less than 68% in surface area.

In order to make the following steps as clear as possible, each step is illustrated with an excerpt of the map above (the excerpt corresponds to the red rectangle).

<u>Industrial estates adjacent to a navigable waterway.</u>

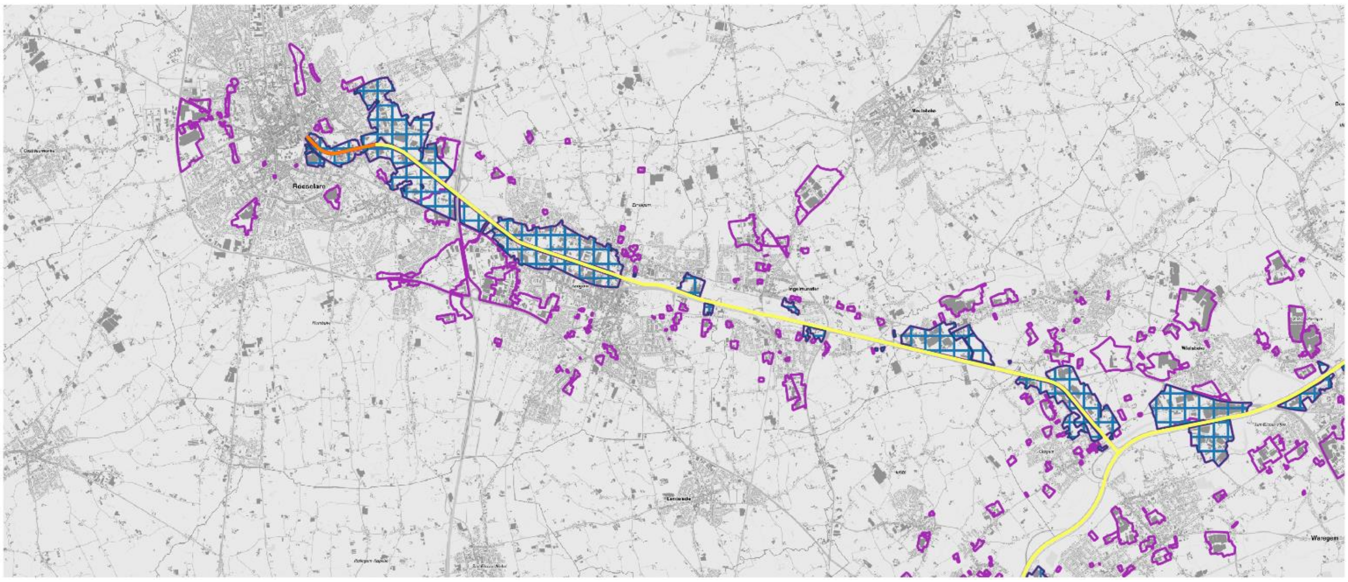


Figure4: Industrial estates adjacent to a navigable waterway - excerpt Roeselare-Leie Canal (blue checkered)

The blue checkered estates are adjacent to a waterway, the purple delineated estates are the previously selected estates located 2km from a waterway

A total of 496 industrial estates were selected, representing a total area of 17,800ha. The average area is 36ha. The estates located in port areas (Antwerp, Ostend, Zeebrugge and Ghent) have been filtered out.

Map layer indicating both industrial estates adjacent to a navigable waterway and quay walls.

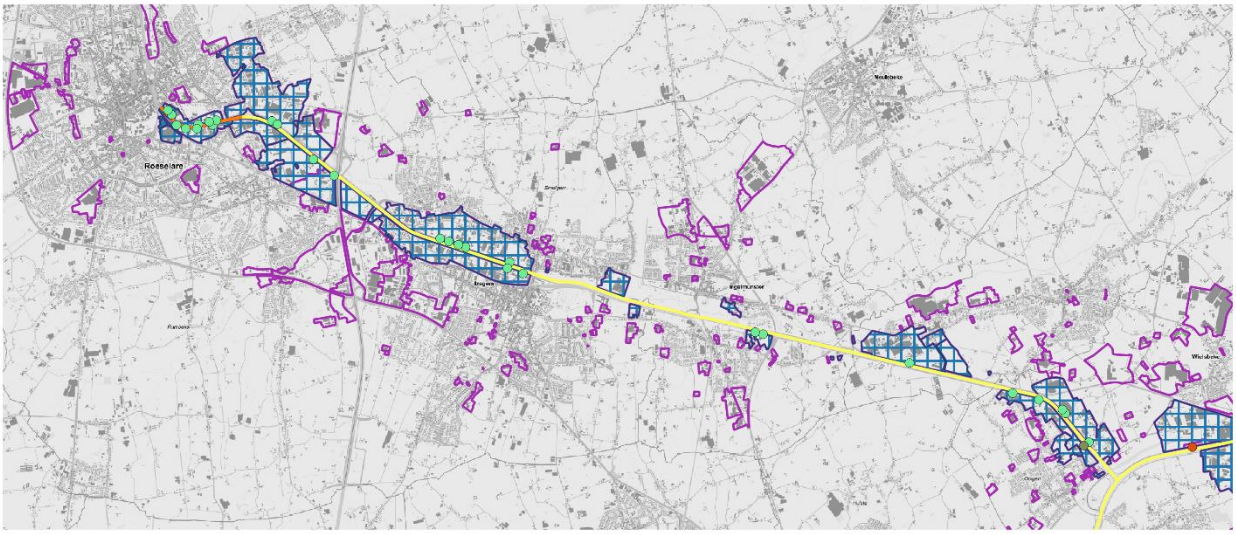


Figure5: Industrial estates adjacent to a navigable waterway + quay walls (excerpt Roeselare-Leie Canal)

The quay walls are marked with a green dot.

Industrial estates with and without transhipment infrastructure, indicated on the map below in green and red respectively:

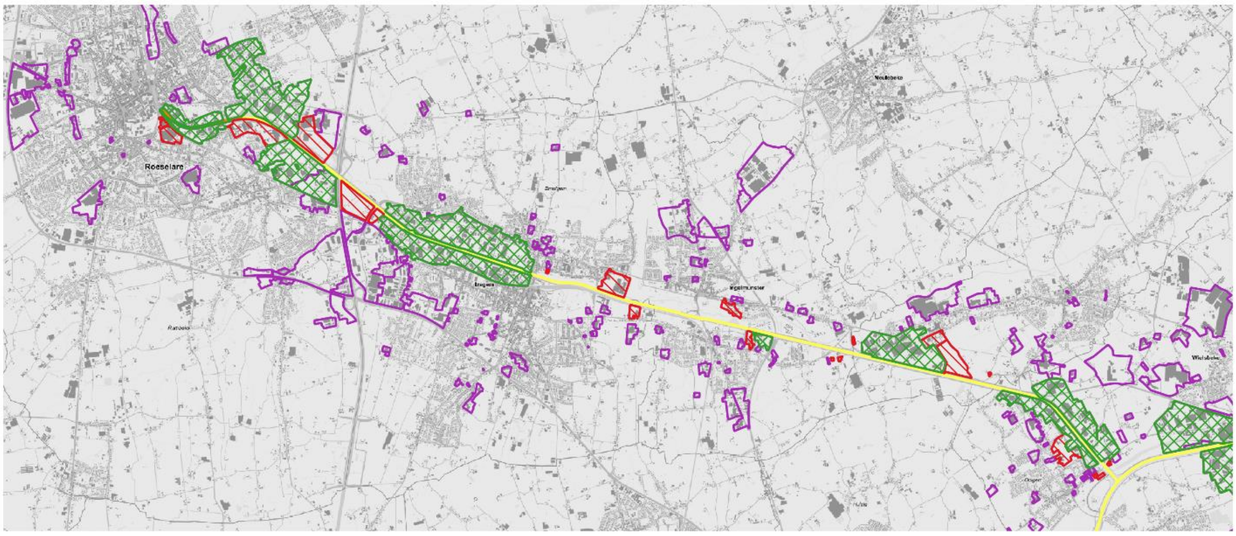


Figure6: Industrial estates with and without transhipment infrastructure (excerpt Roeselare-Leie Canal)

Of all the 496 estates adjacent to a waterway 157 have (BTMO) and 339 do not have transhipment infrastructure (BTZO). The BTMO together form 12,400ha, the BTZO estates 5,400ha. The average surface area is 79 and 16ha respectively.

From this we can conclude that:

- Only 32% of the industrial estates adjacent to a waterway have a water-dependent link-up;
- the BTMO nevertheless represent 70% of the total area of estates adjacent to a waterway;
- the average area of the plots with water-dependent link-up is on average almost five times greater than that of the plots without water-dependent link-up.

Compared to the total number of industrial estates in Flanders, 2.6% is BTMO, which corresponds to 18.8% of the total Flemish business area. The question is whether this ratio is proportional to the level of ambition with regards to a modal shift, especially if we assume that industrial estates adjacent to a waterway are strategic levers for the achievement of a modal shift.

Although on average the BTZO are significantly smaller than their water-dependent counterparts, the total number (339) and surface area (5,400ha) is such that it is certainly worthwhile to further study this potential "iron stock" in new, undeveloped water-dependent industrial estates. The larger estates can, for example, be developed into fully-fledged water-dependent estates where several companies with a water-depended profile can be stablished. Some smaller estates, adjacent to existing estates, can add value to those estates that are ready for expansion. Other smaller estates may be eligible for the development of a new public quay, given the limited space required.

This is discussed in more detail in Chapter 4.

3.1.2 Patterns in the geographic distribution of BTMO's and BTZO's

The heatmap below is based on a cluster analysis and shows where the largest concentrations of BTMO's are located. The darker the colour, the larger the concentration of BTMO's.

We use these heatmaps as overview maps. Other maps can be developed on request.

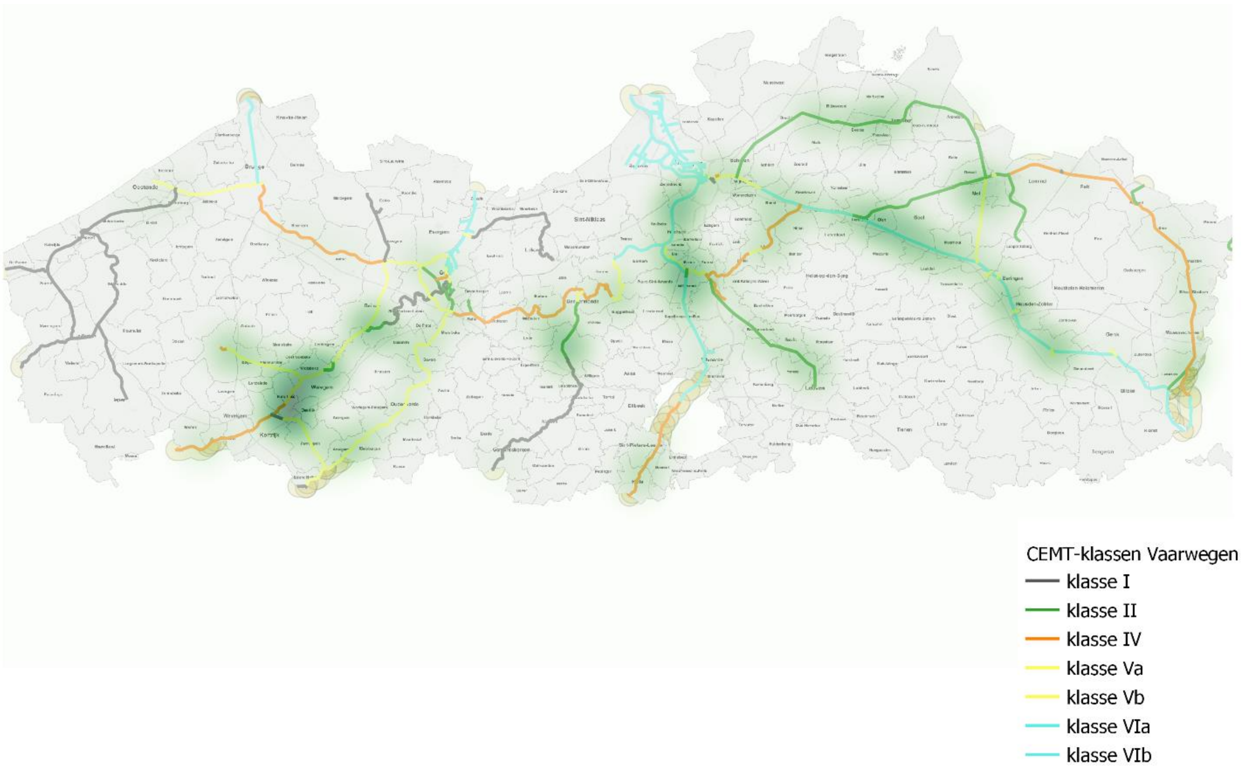


Figure7: Heatmap of the number of BTMO's

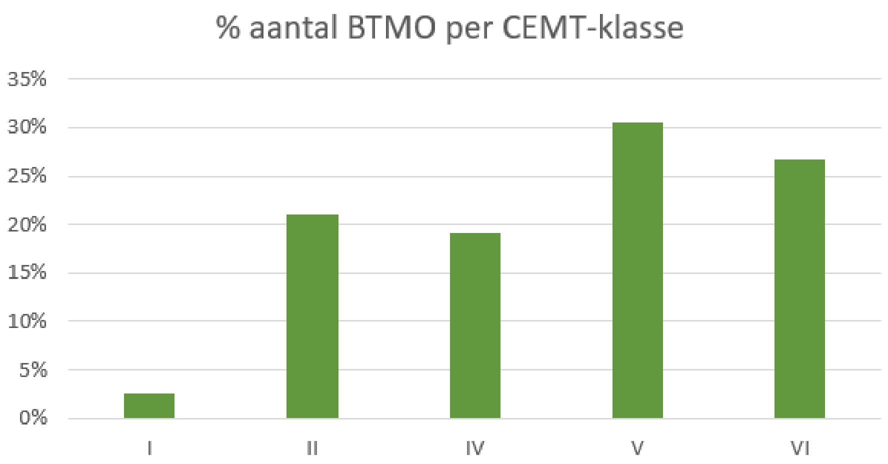
A number of clusters clearly stand out in the distribution of the BTMO's (from West to East):

- Roeselare – Waregem - Kortrijk region
- Deinze region
- Aalst Region
- Puurs – Willebroek region
- Kruibeke – Hoboken region
- Albert Canal
- Rijkevorsel – Turnhout region
- Mol region

It is also notable that there are few estates adjacent to class I waterways (West-Flanders, Moervaart, class I branch of the Dender). The Ghent-Ostend Canal, the Scheldt, and more specifically the Antwerp – Ghent segment and the Zuid-Willemsvaart are weakly represented in terms of the number of BTMO's.

The distribution of the industrial estates per CEMT class is as follows:

Table 1: number of BTMO's per CEMT class



The BTMO's are mainly to be found along class V- and VI waterways.

Class I is clearly less represented.

From this we can conclude that BTMO's are more often found along larger waterways.

The distribution of the BTZO's is much more diffuse. On the heatmap below, the cluster formation is clearly much less prominent, with the exception of the Kortrijk-Waregem-Roeselare region and the Ghent region.

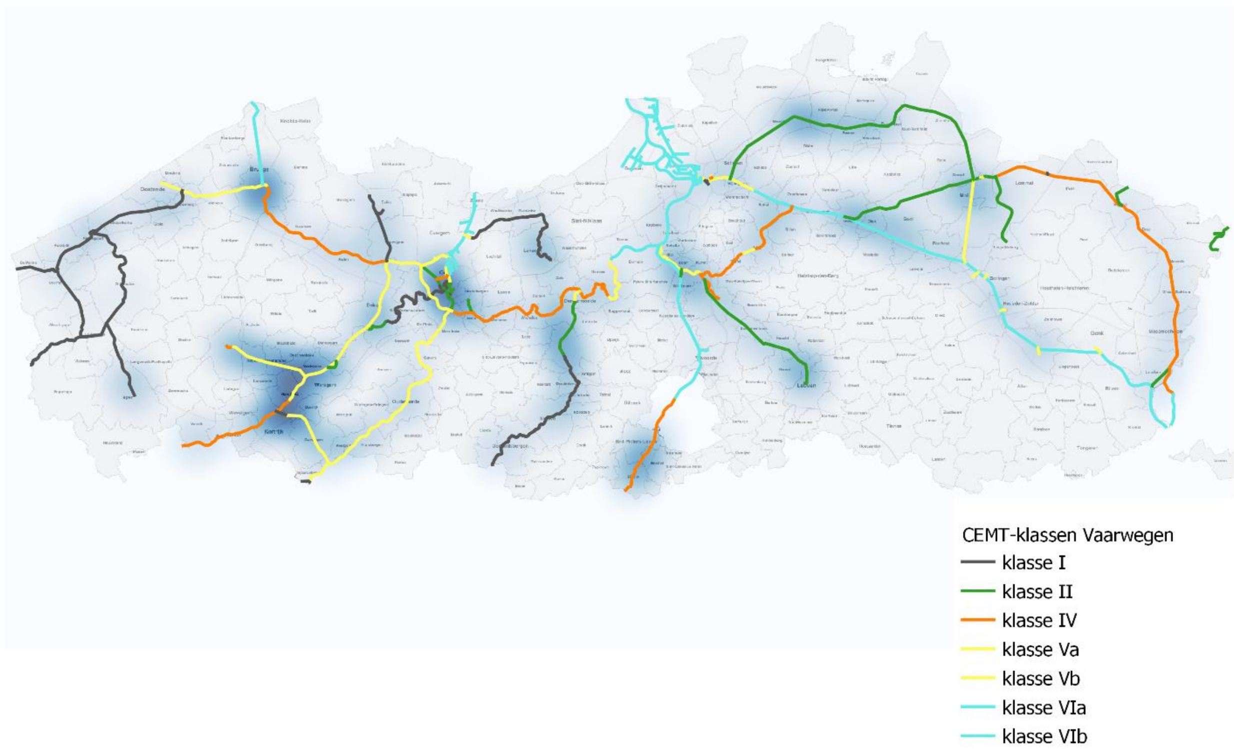
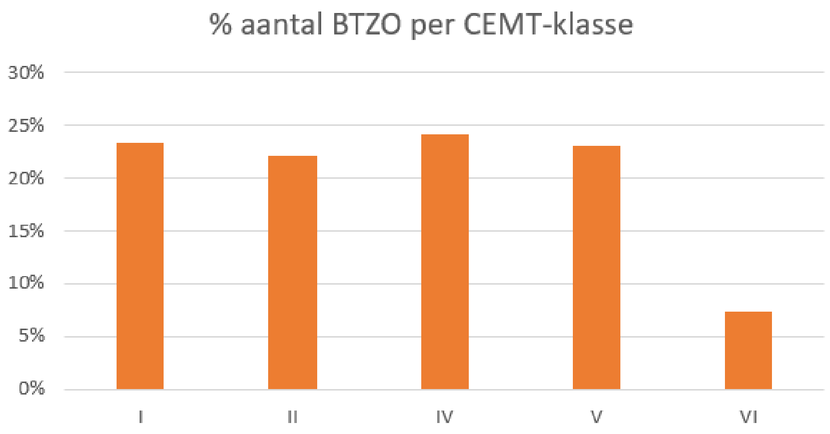


Figure8: Heatmap of the number of BTZO's

This diffuse pattern is reflected in the distribution of the BTZO's according to CEMT class:

Table2: % of the share of BTZO's per CEMT class



Almost all these estates are distributed across CEMT class I through V; only class VI is significantly less represented.

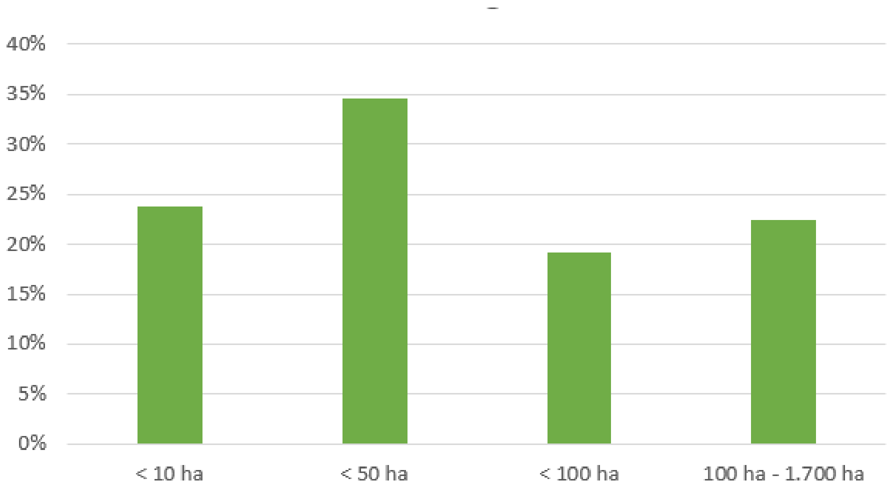
We can conclude from this that:

- The distribution of BTMO's and BTZO's can partly be explained by the clearance of the waterway. BTMO's are ideally located along larger waterways, and are less common along class I waterways. BTZO's occur both along class I, IV and V, and significantly less along class VI waterways.
- BTMO's show a clear cluster formation; BTZO's, on the other hand, show a much more diffuse distribution pattern.
- There are undoubtedly historic reasons for the strong presence of water-dependent activities in the clusters in the south-east of West Flanders, along the Maritime Canal and the Albert Canal.
- The under-representation of BTMO's along the Zeeschelde may due to the tidal nature of the Scheldt. The reason why BTZO's are being considered along the Ghent-Ostend Canal and the Brussels-Charleroi Canal is likely due to the proximity of the respective E40 and E19 motorways, with the link-up of businesses in the region to road transport. The Brussels-Charleroi Canal also functions as a transit canal.

3.1.3 Patterns in the size of the industrial estates

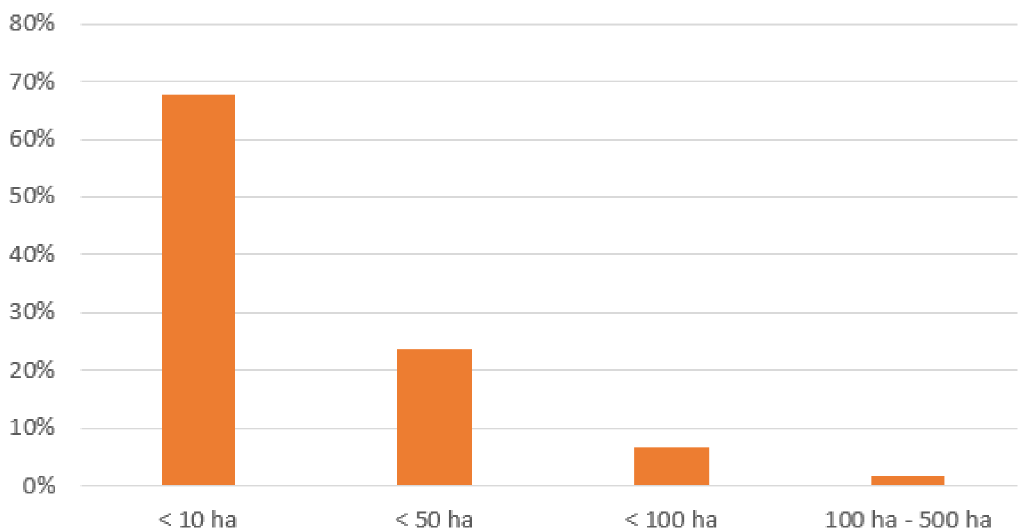
The average surface area of the BTMO's is 79ha, but the area of the individual estates varies significantly, from 0.1ha to almost 1,700ha (Genk). Most estates, about 54 in total, have a surface area of 10 to 50ha (see table 3).

Table3: % share of BTMO's by area



With an average surface area of 16ha, the BTZO's are significantly smaller and have a very different distribution pattern than the BTMO's: from 0.09ha to 464ha.

Table4: % share of BTZO's by area



Over 60% of these estates is smaller than 10ha, followed by the 10 to 50ha class. In the class of the smallest plots, approximately 1/3 is even smaller than 1ha; 45% has a plot size of 1 to 5ha and a little over 20% has a plot size of 5 to 10ha.

Given the fact that plot size is generally considered to be a decisive factor for the effectiveness of a water-dependent industrial estate, we should certainly take into account the fact that some of the BTZO's are actually too small.[15] Nevertheless, some of these estates may offer added value in the context of a possible extension of a water-dependent estate, or for the development of a public quay.

The surface area of the plots, as well as their proximity with respect to BTMO's are therefore two criteria that will be further discussed in the context of the continued approach of the BTZO's (Chapter 4).

3.1.4 Comments

The map layer of the industrial estates does not contain information about the functional use of the estates. We therefore do not know how many and which businesses are established there, let alone which activity is being performed. The research carried out as part of the Inland Shipping 2.0 project shows that, on average, only 20% of the waterway-adjacent estates perform a waterway-related activity. A concrete site visit to the industrial estates is of course essential in order to further refine the level of water-dependency, but based on this observation, it is quite clear that 'infiltration' of water-dependent activities on estates where a limited number of companies actually perform water transport-related work can be an effective lever to increase the share of water transport.

Finally, a small minority of businesses are not located in a zone of land as defined by Flanders Innovation & Entrepreneurship, nor, according to the regional land plan, are these businesses located in an industrial zone. They were therefore not taken into account.

[15] The rule of thumb is that the absolute lower limit of a water-dependent estate is 1ha, and preferably estates of 5ha and larger.

3.2 Tonnages per industrial estate

The transhipment tonnage of 2009 were manually added to the BTMO's, and subsequently divided into five categories.

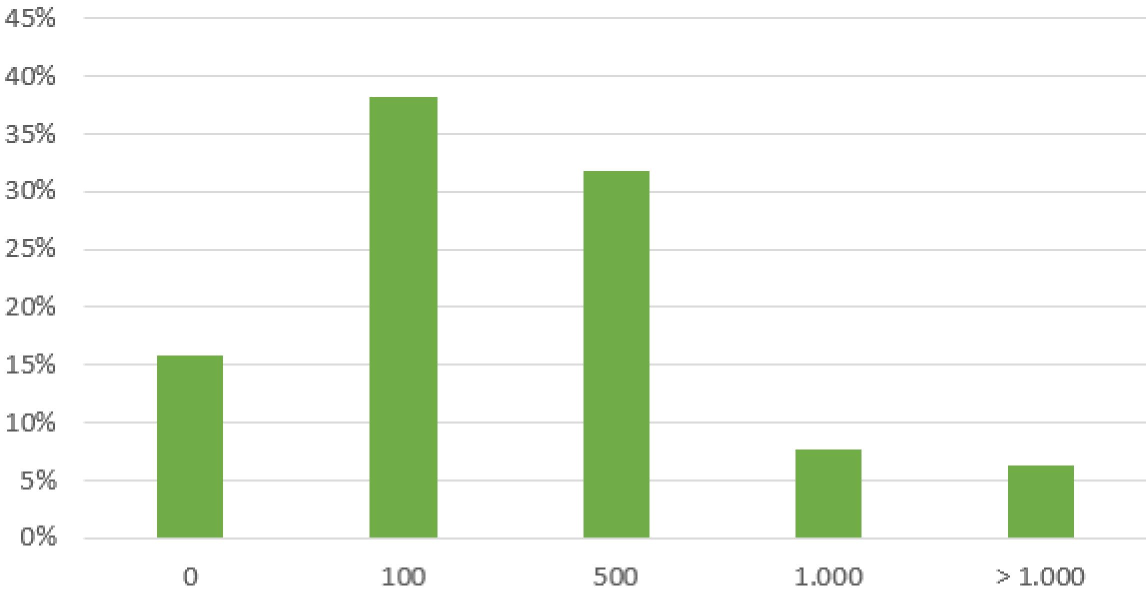
Figure9: Tonnages per industrial estate (excerpt Roeselare - Leie Canal)

The transhipment values vary between 0 and 3.8 million tonnes per estate. The total transhipment activity in 2018 amounts to 42.5 million tonnes. The average transhipment value per industrial estate amounts to 271,000 tonnes. Some estates have only one quay and only one company actively using the waterway, while others have both multiple quays and companies using them.

Figure 10: estates with one or more quay walls - excerpt KRL

The distribution of estates according to the five tonnage categories is as follows:

Table5: % of company share per tonnage class (in 1,000 tonnes)



The table above shows that the tonnage class 100,000 – 500,000 tonnes is the most common, followed by the group of estates loading and/or unloading between 500,000 and 1,000,000 tonnes.

26 BTMO's, approx. 15%, have a quay, but no transhipment activity (0 tonnes).

In the following paragraphs we examine in more detail the geographic distribution of the industrial estates according to the realised transhipment tonnage.

3.2.1 BTMO with tonnage = 0

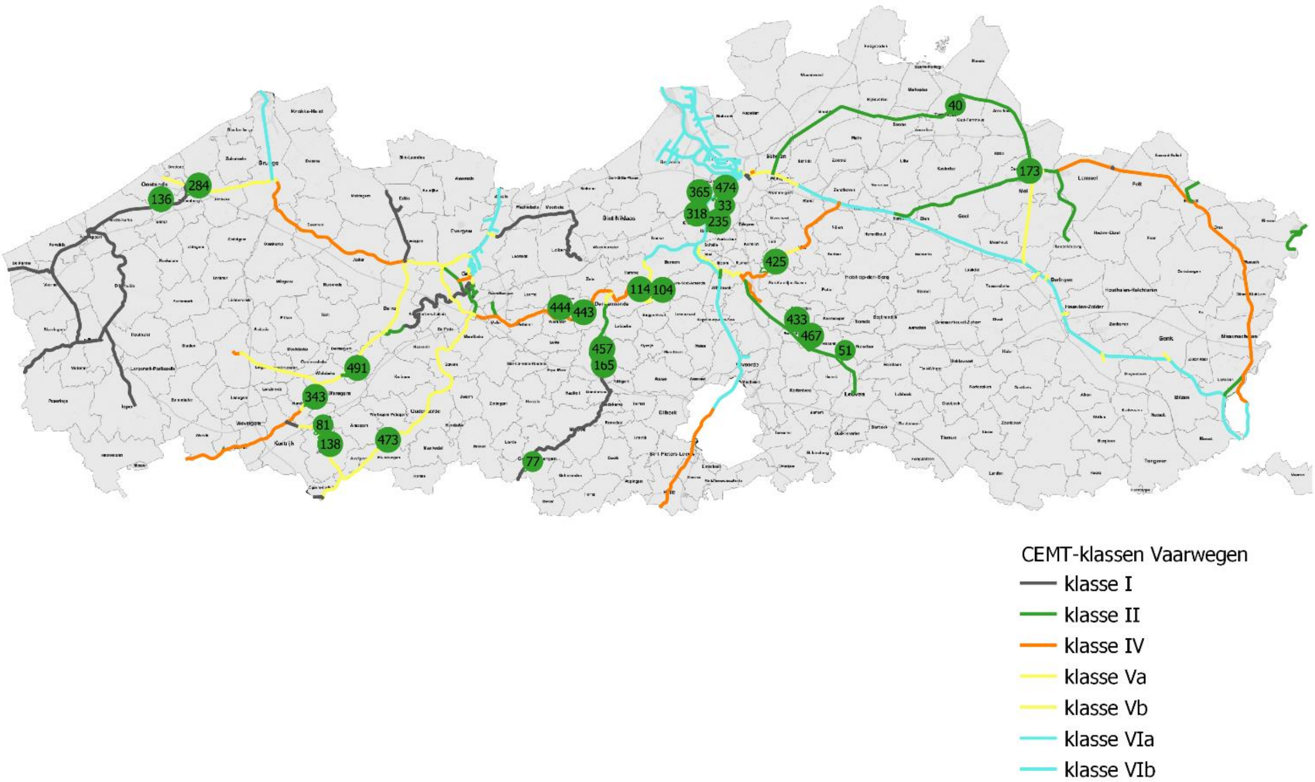


Figure 11: distribution of industrial estates tonnage class = 0

NR	GEMEENTE	TERREIN	OPP
165	Aalst	Hoge Vesten 3/3	0.22
457	Aalst	Pierre Corneliskaai	2.86
33	Antwerpen	Petroleum Zuid/Blue Gate Antwerp	113.73
473	Avelgem	geen naam	0.31
433	Boortmeerbeek	Hever	10.66
467	Boortmeerbeek	Boortmeerbeek-Kanaal	39.66
104	Buggenhout	Brielstraat	4.43
114	Dendermonde	Sint Ursmarusstraat	3.83
173	Dessel	Goormansdijk De Zate	3.15
425	Duffel	Notmeir	108.59
77	Geraardsbergen	Unalpark	25.41
136	Gistel	Kalsijdebrug Noord	2.43
51	Haacht	Bedrijvenzone Hambos	41.12
343	Harelbeke	Vaernewijkstraat 1	8.89
235	Hemiksem	Terlocht	27.46
318	Kruibeke / Zwijndrecht	Industriezone tussen N419 en Schelde	20.91
284	Oudenburg	BPA De Witte Bergen	27.08
40	Turnhout	Oude Kaai	3.43
491	Waregem	Vijvestraat	7.63
444	Wichelen	Meerbos	17.05
443	Wichelen / Dendermonde	Bohemen	9.04
81	Zwevegem	Blokkestraat	37.47
138	Zwevegem	Breemeers	26.1
365	Zwijndrecht	Oeverkant	50.94
474	Zwijndrecht	Hye	3

No transhipment capacity was recorded for these 25 estates in 2018. For the estates located on the Lower Zeeschelde, near Antwerp, this is due to the fact that goods flows do not pass through locks. For a number of businesses the reason is likely the small clearance waterway, such as in West-Flanders, de Dender (south of Aalst, Leuven-Dijle Canal and Dessel-Turnhout-Schoten Canal. Nevertheless, some estates are adjacent to larger waterways, for example the Leie or the Scheldt.

3.2.2 Industrial estates with tonnage of up to 100,000 tonnes

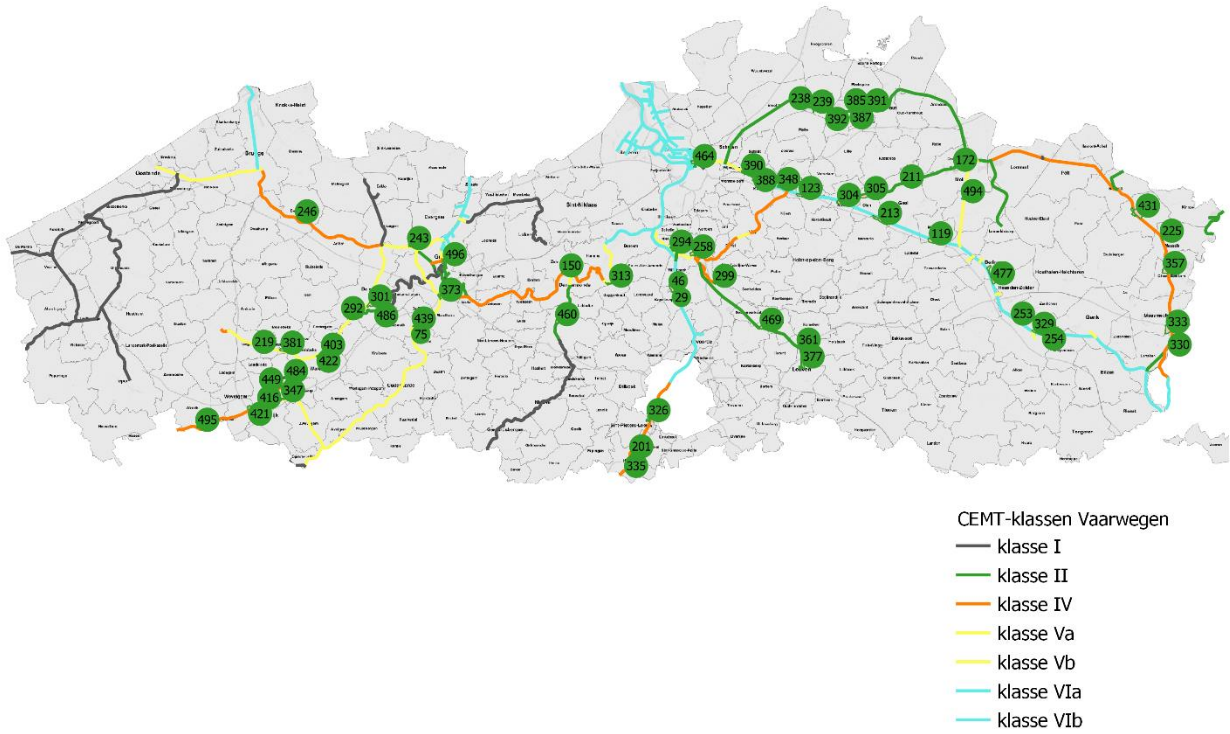


Figure 12: distribution of industrial estates with a tonnage class up to 100,000 tonnes

This class is generally well distributed across the entire waterway network, with the exception of Class I waterways (West-Flanders and Dender), Nete Canal, Ghent-Ostend Canal, Upper-Zeescheldt, Upper-Scheldt. This class consists of a total of 60 estates.

NR	GEMEENTE	TERREIN	OPP
460	Aalst	Noord II (Hofstade)	56.45
464	Antwerpen	Eilandje	71.77
494	Balen	Molsesteenweg 1	17.5
246	Beernem	Vaart-Noord 1/2	1.56
385	Beerse	Kanaal Schoten Dessel 2	21.65
387	Beerse	Kanaal Schoten Dessel 4	7.52
392	Beerse	Kanaal Schoten Dessel KMO	14.03
391	Beerse / Turnhout	Kanaal Schoten Dessel 1	19.19
477	Beringen	Noord	116.08
294	Boom	Noeveren - Scherpenhoek	21
431	Bree	Kanaal	239.88
301	Deinze	Vaartlaan Filliersdreef	86.84
486	Deinze	Kapellestraat	11.13
292	Deinze / Zulte	Europalaan	38.41
313	Dendermonde / Buggenhout	Briel	25.41
172	Dessel	Goormansdijk De Schans Noord	30.44
357	Dilsen-Stokkem	Rotem	104.83
75	Gavere	Markt en omgeving	2.54
211	Geel	Aard Zuid	4.28
373	Gent	E17 E40 Zwijnaarde	41.42
496	Gent	R4 N424 Afrikalaan Koopvaardijlaan	70.73
123	Grobbendonk	ENA 20 Z.1 (Beverdonk)	60.69
201	Halle	Nederhem	2.62
335	Halle	Suikerkaai West	2.4
484	Harelbeke	Overleiestraat 3	32.28
347	Harelbeke / Kuurne	Watermolenstraat	2.46
253	Hasselt	Stokrooie	6.46
254	Hasselt	Noord 3000	37.81
329	Hasselt	Noord 2000	33.02
304	Herentals	ENA 20 Z.2 (Heirenbroek)	49.81
219	Ingelmunster	Gentstraat-Noord 4/5	4.54
469	Kampenhout	Kampenhout-Sas	38.94
29	Kapelle-op-den-Bos	Kuiermanstraat	26.34
416	Kortrijk / Harelbeke	Stasegem	27.95
449	Kuurne	Lt. Gen. Gerardstraat	8.32
361	Leuven	Wijgmaal / Remy-site	13.61

NR	GEMEENTE	TERREIN	OPP
377	Leuven	Aarschotsesteenweg-Dijledreef	62.61
243	Lovendegem	Bierstal	11.47
225	Maaseik	Geisterveld	16.58
330	Maasmechelen	Uikhoven	5.7
333	Maasmechelen	Oude Bunders	161.19
299	Mechelen	Rode Kruisplein 2	8.56
119	Meerhout / Laakdal	Biezenhoed Zuid	77.46
439	Nazareth	Sluis	8.05
305	Olen	ENA 22 Z.7 (Zone 3)	127.46
381	Oostrozebeke	Spookkasteel	52.57
388	Ranst	Oelegem Ter Straten	84.91
238	Rijkevorsel	Kanaal Schoten Dessel Vaart	11.88
239	Rijkevorsel	Kanaal Schoten Dessel Nijverheidsweg	38.21
258	Rumst	Zone 2 Catenberg	79.9
326	Sint-Pieters-Leeuw	S.P.L.-Kanaal	67.21
403	Waregem	E. Clausstraat 3/4	4.48
422	Waregem	E. Clausstraat 1/4	19.5
495	Wervik	Pontstraat	5.39
213	Westerlo	ENA 23 Z.2 (Punt 5)	143.72
421	Wevelgem / Kortrijk	Zuid	85.89
46	Willebroek	Zuid (Kersdonk)	84.78
390	Wommelgem / Wijnegem / Schilde	Stokerij	24.58
348	Zandhoven	Massenhoven Vaartstraat	17.54
150	Zele	Ambachtelijke zone Heirbaan	1.36

3.2.3 Industrial estates with tonnage of 100,000 – 500,000 tonnes

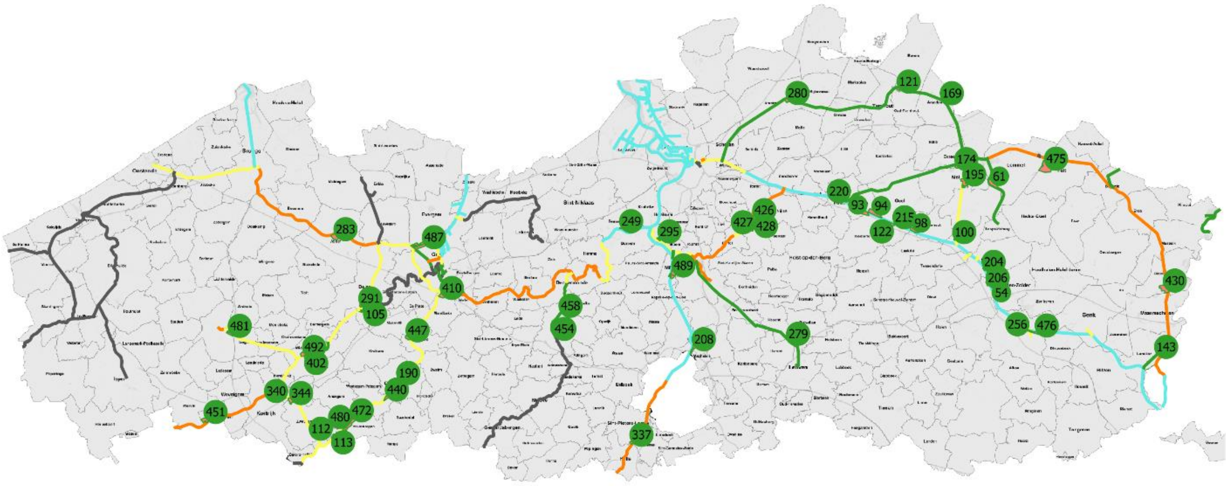


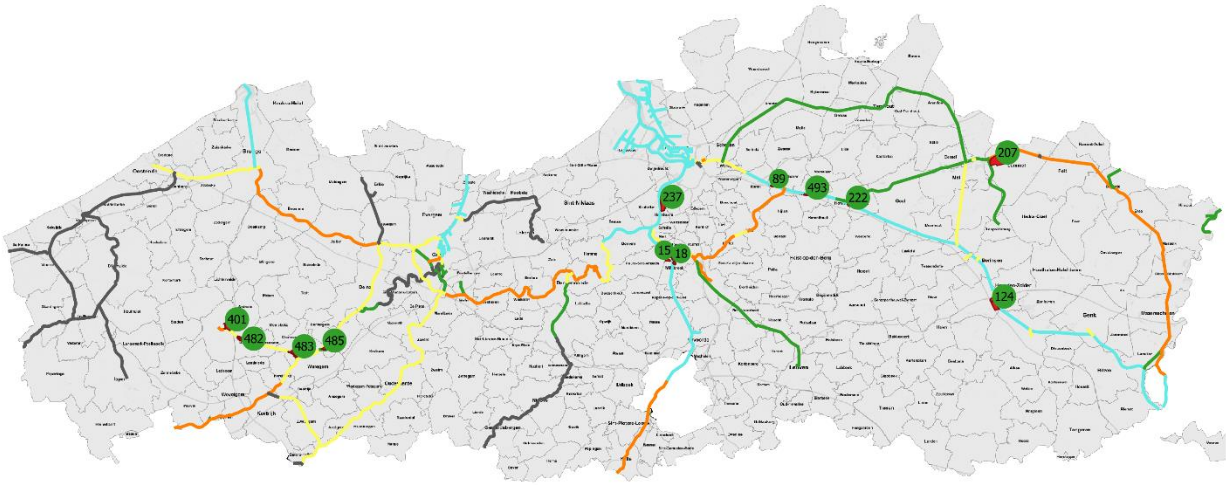
Figure 13: industrial estates tonnage class 100,000 – 500,000 tonnes

This Class, consisting of 50 companies, is also very widespread, mainly along the larger waterways and Upper-Scheldt, Nete Canal and Albert Canal in particular. Class I and II waterways, Ghent-Ostend Canal, Zeeschelde are not or less common.

NR	GEMEENTE	TERREIN	OPP
454	Aalst	Amylum	8.3
458	Aalst	Denderkaai - Herdersem	2.85
283	Aalter	Lakeland	149.97
169	Arendonk	Brug V	10.29
113	Avelgem	Nijverheidslaan	47.87
472	Avelgem	Kapellestraat	3
61	Balen	Wezel Driehoek	137.39
204	Beringen	Haven	11.43
280	Brecht	D'Hoef 2 (Zone 4)	52.15
105	Deinze	Tolpoortstraat	2.22
291	Deinze	Dossche	15.52
174	Dessel	Sibelco	30.48
430	Dilsen-Stokkem	Lanklaar	227.68
447	Gavere	Gavere - Asper	50.16
122	Geel	ENA 23 Z.1 (Punt 3)	145.47
215	Geel	Brandemolenstraat	0.81
98	Geel / Meerhout	ENA 24 Z.4 en 5 (Hezemeerheide I+II)	84.43
94	Geel / Olen	ENA 23 Z.3 (West Zone 4)	171.09
410	Gent	E40 R4 Kanaal van Zwijnaarde	83.43
487	Gent - Evergem		302.65
100	Ham	Staatsbaan	7.64
340	Harelbeke	Kanaalzone	24.17
256	Hasselt	Ring 8000	56.34
476	Hasselt	Ring 7000	79.94
279	Herent	Zijpstraat / Cargill Malt	3.17
220	Herentals	ENA 20 Z.4 (Laagland)	19.37
480	Kluisbergen	Ruien - Berchem	145.94
143	Lanaken	Neerharen	7.92
426	Lier	Netekanaal	28.35
427	Lier	Aarschotsesteenweg	11.48
428	Lier	Berlaarsesteenweg	9.33
206	Lummen	Gestel	55.83
54	Lummen / Heusden-Zolder	Kolenhaven-Zolder	60.71
451	Menen / Wervik	Grensland	124.96
195	Mol / Balen	Berkebossen Colburnlei	169.44
295	Niel	De Laetstraat	31.13

NR	GEMEENTE	TERREIN	OPP
93	Olen / Westerlo	ENA 22 Z.3 (Zone 2)	147.4
190	Oudenaarde	Vande Moortel	13.31
440	Oudenaarde	Meersbloem	63.04
475	Overpelt/Neerpelt/Overpelt	Overpelt-Zinkfabriek	455.05
121	Ravels	Kanaaldijk	33.99
481	Roeselare	Lekkenstraat art17	64.2
337	Sint-Pieters-Leeuw	Zenneveld	29.76
249	Temse	Belgomine	4.59
208	Vilvoorde	Het Broek	51.17
402	Waregem / Wielsbeke	Desselgem	45.72
492	Wielsbeke / Waregem	Ooigemstraat/Molenstraat 1	83.15
489	Willebroek	Tisselt 1	135.02
112	Zwevegem	Moen Trekweg	25.5
344	Zwevegem / Harelbeke	De Blokken	99.73

3.2.4 Industrial estates with tonnage of 500,000 – 1,000,000 tonnes



NR	GEMEENTE	TERREIN	OPP
237	Antwerpen	Hoboken Umicore	184.34
493	Grobbendonk	ENA 20 Z.1 (Kerkheide 1)	59.4
222	Herentals	Aarschotseweg	10.31
124	Heusden-Zolder / Lummen	Zolder-Lummen	212.03
482	Izegem	Mandeldal uitbreiding	157.52
207	Lommel	Maatheide	476.76
401	Roeselare	Haven (De Pilders)	101.74
483	Wielsbeke	Vaartstraat-Oost	84.8
485	Wielsbeke	D'Hooie (niet watergebonden)	43.33
15	Willebroek	De Veert (Noord West 5)	122.41
18	Willebroek	Noord Oost 4	58.77
89	Zandhoven	Massenhoven Zagerijstraat	17.24

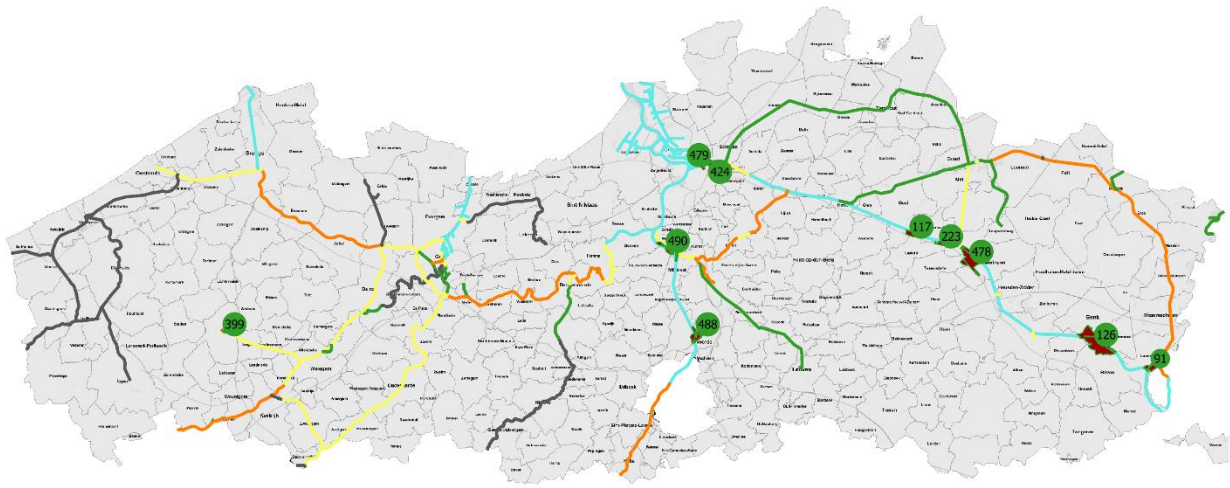
Figure 14: industrial estates tonnage class 500,000 – 1,000,000 tonnes

This class is clearly reserved for a number of specific locations, i.e:

- Roeselare cluster
- Wielsbeke
- Hoboken (Umicore)
- Puurs cluster
- Albert Canal
- Maatheide (Lommel)

The accessibility of the waterways along which these clusters are located is, combined with the business activities taking place there (animal feed, fertilisers, building materials, inland container terminals), probably the likeliest explanation for these high transhipment tonnages.

3.2.5 Industrial estates with tonnage > 1,000,000 tonnes



NR	GEMEENTE	TERREIN	OPP
424	Antwerpen / Wijnegem / Schoten	Merksem Albertkanaal Zuid	197.46
117	Geel / Laakdal	ENA 24 Z.1 en 2 (Oost 2)	178.57
126	Genk / Bilzen / Zutendaal / Diepenbeek	Genk-zuid	1685.87
488	Grimbergen / Vilvoorde	Oostvaartdijk	357.75
478	Ham/Tessenderlo/Beringen	Zandstraat	978.51
91	Lanaken	Lanaken	217.27
223	Meerhout / Laakdal	ENA 25 Z.2 (Langvoort)	109.85
490	Puurs / Bornem	Kanaal Gansbroekstraat	163.32
399	Roeselare	Kaaistraat	27.7
479	Schoten	Kanaal Liebiglaan	153.24

10 businesses have a transhipment activity of over 1 million tonnes. These businesses are mainly located along the Albert Canal, but are also located in Roeselare, Vilvoorde-Grimbergen, Puurs and Antwerp. The largest inland transhipment takes place in the port of Genk, with over 3.8 million tonnes.

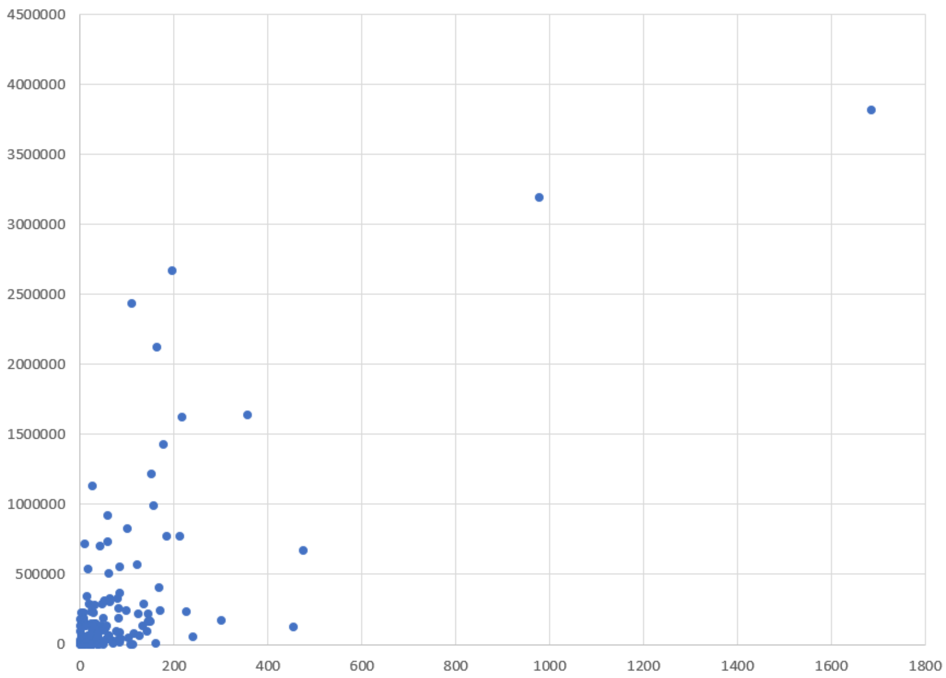
3.2.6 Connection between surface area and tonnage

If we plot the surface area for each estate in relation to the realised tonnage, we arrive at the graph below. The graph clearly shows that there is a strong concentration of estates < 200ha with less than 500,000 tonnes, with outliers with regard to both tonnage and surface area. The correlation coefficient is 0.72, which is quite high.[16]. If we remove the two largest outliers, however, in both surface area and tonnage (port of Genk and Tessenderlo), the correlation drops to 0.44. The connection between surface area and tonnage is therefore not that clear-cut.

The high correlation factor of 0.72 is thus mainly determined by these two outliers, but they are not particularly relevant to the total number of industrial estates.

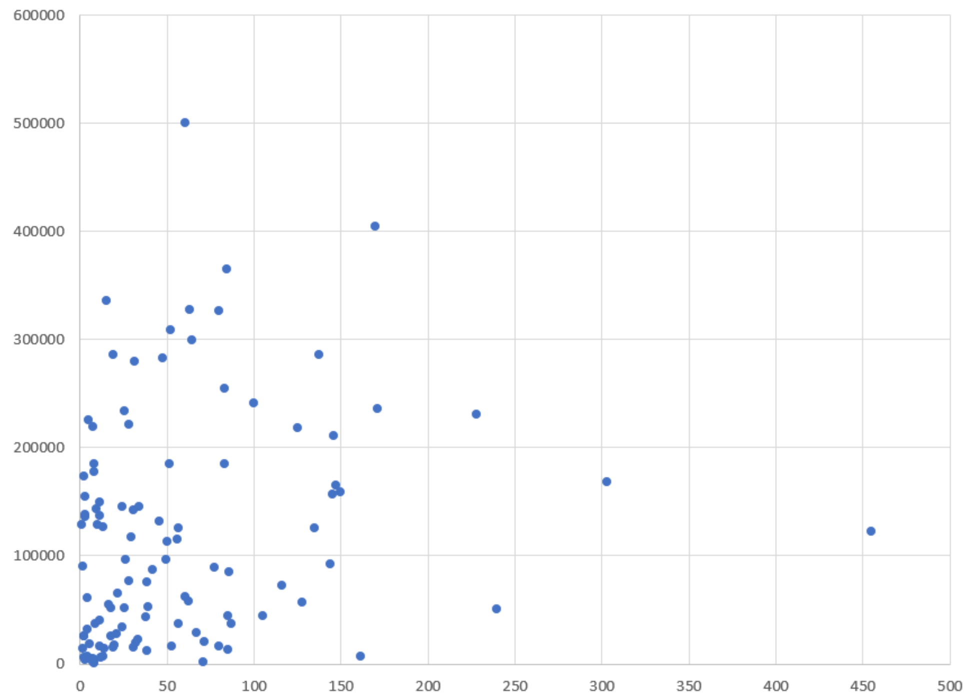
[16] A correlation factor is a number between 0 and 1; the closer to 1 the greater the correlation between the two factors to be compared.

Table 6: correlation tonnage - surface areas



If we zoom in on companies of 500,000 tonnes and less, the correlation drops further to 0.22. The graph below clearly illustrates the underlying reason: these are both relatively large areas with low tonnages (bottom right) and small areas with high tonnages (top left), and multiple variations in between.

Table 7: correlation tonnage - surface area (max 500,000 tonnes)



An underlying reason is the fact that an estate contains one or more businesses, water-dependent or not. The correlation factor between the surface area of an individual business and the achieved tonnage of that particular business may be higher. This is, however, outside the scope of this study. Another strong correlation factor could be the relationship between quay wall length and achieved tonnage, given that the PPS scheme is directly linked to the tonnage to be achieved.

It is therefore prudent to be cautious, e.g. to extrapolate a transhipment tonnage from a given estate area. Other factors also play a role, such as the clearance of a waterway or type of business activity. It is also advisable to estimate potential tonnages using various sources - including this study. See further in Chapter 4.

3.2.7 Conclusion

The tonnages achieved per industrial estate vary widely, ranging from 0 to more than 3.8 million tonnes; the link to the surface area is not clear-cut.

We should therefore exercise caution when it comes to assessing estates if we base our calculations solely on tonnage. The tonnage result of an individual business is highly dependent on the situation specific to the company (size of the company, share that is eligible for transhipment, readiness for inland navigation, type of goods, etc.). Some companies make significant efforts to achieve relatively low tonnages, while others are active in sectors where volumes are traditionally supplied or transported by inland navigation.

Something else that plays a role are conditions and restrictions imposed by public authorities (e.g. through permits), which may or may not encourage some businesses to engage in water-dependent activity. Pressure from local residents, environmental authorities and environmental factors therefore also play a role in the development of water-dependent activities, both positively and negatively affecting the tonnage balance.

It’s one thing whether the annual tonnage per estate is large or small; a sub-study by Inland Shipping 2.0 shows that the average functional utilisation rate of water-dependent estates in Flanders is sub-standard and barely 20%.

A combination of the two studies can therefore be used to develop a targeted approach per estate, independent of the realised tonnage, both for the transport expert who carries out a screening of the potential for this estate and for the dossier manager searching for a suitable potential grantor. However, this requires on-site screening in order to estimate the present business potential as realistically as possible, both in terms of tonnage potential, number of (new) water-dependent businesses, and space to be put to good use.

3.3 Public quay walls

A public quay is a loading and unloading installation owned by a waterway manager which may be used by third parties for transshipment purposes under the terms of an agreement or a licence.

The working area of De Vlaamse Waterweg NV currently includes 42 public quay walls. Approximately half of these quay walls are actively used for transhipment, albeit sporadically in many cases. There are various reasons some quay walls are not used or used sporadically. Some quay walls cannot be used because they do not have good access to the road network. Others are badly located (urban environment), or have fallen into disuse due to overlap with a new use (e.g. marina, urban development project).

The tonnages were requested via FRISbi. The public quay walls are arranged by waterway and municipality in the table.

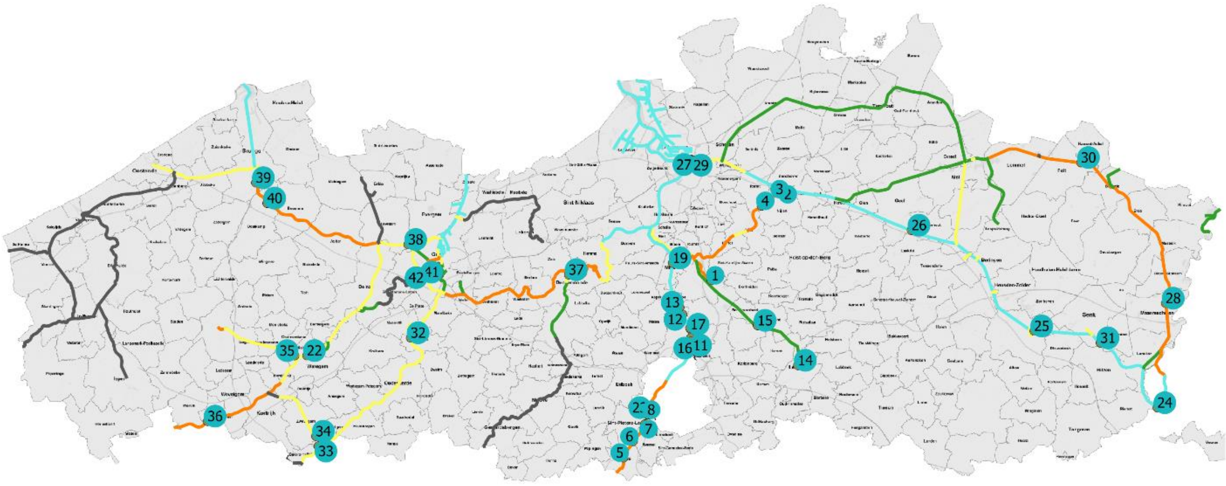


Figure 15: locations of the public quay walls (blue dots)

NR	OBJECTNAME	WW_NAME	TONNAGE	LONAME
1	Kaai InterBeton (vroegere Becquet-Beton) & slipway	Dijle	37000	Mechelen
2	Kaai Viersel 1	Netekanaal	0	Zandhoven
3	Kaai Viersel 2	Netekanaal	0	Zandhoven
4	De Vos - Kets	Netekanaal	0	Ranst
5	Kaai Denayer	Kanaal naar Charleroi	25000	Halle
6	Kaai Interbeton SINT-PIETERS-LEEUW	Kanaal naar Charleroi	117000	Sint-Pieters-Leeuw
7	Kaai Molens Ruisbroek	Kanaal naar Charleroi	0	Sint-Pieters-Leeuw
8	Kaai Electrabel opwaarts	Kanaal naar Charleroi	0	Sint-Pieters-Leeuw
9	Kaai Electrabel afwaarts	Kanaal naar Charleroi	0	Sint-Pieters-Leeuw
10	Kaai Electrabel midden	Kanaal naar Charleroi	0	Sint-Pieters-Leeuw
11	Kaai Koekoekx	Zeekanaal Brussel-Schelde	7000	Vilvoorde
12	Kaai W&Z ex-Binst (Humbeek)	Zeekanaal Brussel-Schelde	1000	Grimbergen
13	Kaai Bos van Aa	Zeekanaal Brussel-Schelde	3000	Zemst
14	Kaai Interbrew	Kanaal Leuven-Dijle	1000	Leuven
15	Kaai Piva	Kanaal Leuven-Dijle	29000	Kampenhout
16	Overslag zeevaart - binnenvaart	Zeekanaal Brussel-Schelde	1000	Vilvoorde
17	Kaai ex-Interbeton	Zeekanaal Brussel-Schelde	75000	Grimbergen
18	Kaai ex-Total Cockerie de Brabant	Zeekanaal Brussel-Schelde	20000	Grimbergen
19	Kaai ex-De Naeyer	Zeekanaal Brussel-Schelde	6000	Willebroek
20	Kaai Tessenderlo Chemie	Zeekanaal Brussel-Schelde	47000	Grimbergen
21	Kaai Parmentier	Zeekanaal Brussel-Schelde	24000	Vilvoorde
22	Devarec NV	Leie	132415	Waregem
23	Onbekend	Kanaal naar Charleroi	1425	Sint-Pieters-Leeuw
24	openbare kaaimuur Kanne (Riemst)	Albertkanaal	0	Riemst
25	openbare kaaimuur Handelskaai (Hasselt)	Albertkanaal	29000	Hasselt
26	openbare kaaimuur Hezemeer (Geel)	Albertkanaal	57000	Geel
27	openbare kaaimuur Staatsburgdok (Antwerpen)	Albertkanaal	0	Antwerpen
28	openbare kaaimuur Kauberg (Maasmechelen)	Zuid-Willemsvaart	0	Maasmechelen
29	openbare kaaimuur Bredastraat (Antwerpen)	Albertkanaal	4000	Antwerpen
30	openbare kaarimuur Vanderstraat (Neerpelt)	Kanaal Bocholt-Herentals	0	Neerpelt
31	openbare kaaimuur Bilzerweg (Genk) 38,3	Albertkanaal	0	Genk
32	Openbare terminal Gavere	Boven-Schelde	6000	Gavere
33	Openbare terminal Bossuit	Boven-Schelde	1000	Celles
34	Openbare terminal Moen	Kanaal Bossuit-Kortrijk	17000	Zwevegem
35	Openbare terminal Wielsbeke	Kanaal Roeselare-Leie	4000	Wielsbeke

NR	OBJECTNAME	WW_NAME	TONNAGE	LONAME
36	Openbare terminal Grensland	Grensleie	70000	Menen
37	Openbare terminal Dendermonde	Dender	96000	Dendermonde
38	Openbare terminal Bierstalkaai	Kanaal Gent-Oostende	16000	Lovendegem
39	Openbare terminal Kanaaleiland	Kanaal Gent-Oostende	0	Brugge
40	Openbare terminal Moerbrugge	Kanaal Gent-Oostende	0	Oostkamp
41	Openbare terminal Snepkaai	Leie	0	Gent
42	Openbare terminal Snepkaai - milieustation	Leie	0	Gent

Table 8: number of public quay walls per transhipment tonnage

	Tonnage	number
No transhipment	0	16
Sporadic transhipment	< 10,000 tonnes	11
Limited transhipment	10,000 – 50,000 tonnes	9
Regular transhipment	50,000 – 130,000 tonnes	6

The above tables show that some public quay walls are used regularly; (virtually) no transhipment takes place on many, on the other hand. All in all, transhipment activity involving public quay walls is therefore limited. Only two quay walls have a transhipment activity exceeding 100,000. Moreover, it is notable that the quay walls that are in limited or regular use are often used by a single company, i.e. essentially as a private quay wall. The quay walls where no transhipment takes place are in all cases not or only conditionally usable (e.g. due to the fact that the quay is in poor condition or difficult to reach).

A number of these quay walls are located on an industrial estate, while others are not.

Table 9: number of public quay walls located on an estate or not

	Number
Located on an estate	17
Not located on an estate	25

This is a list of estates located near a public quay wall.

NR	GEMEENTE	TERREIN	OPP (ha)
18	Willebroek	Noord Oost 4	58.77
75	Gavere	Market and surroundings	2.54
98	Geel / Meerhout	ENA 24 Z.4 and 5 (Hezemeerheide I+II)	84.43
112	Zwevegem	Moen Trekweg	25.5
126	Genk / Bilzen / Zutendaal / Diepenbeek	Genk-zuid	1685.87
208	Vilvoorde	Het Broek	51.17
243	Lovendegem	Bierstal	11.47
299	Mechelen	Rode Kruisplein 2	8.56
326	Sint-Pieters-Leeuw	S.P.L. Canal	67.21
335	Halle	Suikerkaai West	2.4
337	Sint-Pieters-Leeuw	Zenneveld	29.76
402	Waregem / Wielsbeke	Desselgem	45.72
451	Menen / Wervik	Grensland	124.96
464	Antwerp	Eilandje	71.77
469	Kampenhout	Kampenhout-Sas	38.94
483	Wielsbeke	Vaartstraat-Oost	84.8
488	Grimbergen / Vilvoorde	Oostvaartdijk	357.75

Almost all waterways have public quay walls, with the exception of class I waterways, Dessel-Turnhout-Schoten Canal, Bocholt-Herentals Canal and Dessel-Kwaadmechelen Canal. The Maritime Canal/Canal to Charleroi is the axis with the most quay walls.

Conclusion:

- Some public quay walls are used regularly; most have however fallen into disuse or could be used more optimally if a number of preconditions were met. In those cases, road access often proves to be a hindrance.
- A number of public quay walls are linked to an industrial estate and are used by a specific company. The question is whether shared used by other nearby companies is an option.
- The function of some public quay walls is compromised by the fact that this activity is not compatible with another activity located there, such as urban development or the development of a marina; or there is inadequate road access. The question is which policy options De Vlaamse Waterweg wants to employ.

- Public quay walls can be a valuable addition to existing private and PPP quay walls. After all, public quay walls offer businesses the opportunity to use the motorway, even if they can’t afford their own quay wall, e.g. because they have excessively low or irregular tonnages, or because they are not linked to a waterway. Vision development is needed in order to be able to make full use of this role, based on the following key questions:
    - What is the intended geographic distribution of the public quay walls?
    - What are the quality requirements of the design: accessibility, possibility of temporary storage, quay wall surface area and length?
    - How and according to which rules is the use of public quay walls managed and organised, particularly in the case of multiple users?
    - What synergies are possible with other, modal shift stimulating projects, such as Binnenvaart 2.0, Distribouw, the LAMBIT-model, etc.?
    - How is the use of public quay walls stimulated (communication, support measures, etc.)?

4 CRITERIA OF POTENTIAL FUTURE ESTATES – PUBLIC QUAY WALLS

4.1 Introduction

We cannot equip all estates adjacent to a navigable waterway with transhipment infrastructure. Some are too small, or not optimally located, or are located near another, well-connected estate or public quay wall. We do, however, know that some estates can play a strategic role, for example in the creation of the ENA or the ENES, or other future developments.

The purpose of this fourth chapter is to discuss a number of criteria in order to deal with the following in a well-founded manner:

1) industrial estates not equipped for water-dependent activities;
2) industrial estates which, although water-dependent, are assumed to be ripe for optimisation and/or improvement in the use of transhipment infrastructure;
3) the use and expansion of public quay walls.

4.2 Criteria for the selection of non-water-dependent estates

We propose using the following criteria:

- surface areas;
- proximity to other water-dependent estates;
- type of waterway;
- regional land plan;
- access;
- future developments.

4.2.1 Surface area

The present study shows that the average area of the BTMO's is 79ha, and that around 35% of these estates has a surface area of 10 to 50ha.

However, it appears that the BTZO's are often smaller (over 60% are smaller than 10ha). These estates may be sufficient for the water-dependent development of one or at least a limited number of businesses. A larger surface area is more appropriate in case of large-scale development. Smaller plots, on the other hand can add value to the expansion of existing estates.

The surface area of an industrial estate cannot be separated from the development density of the estate. As previously mentioned, this study does not allow any pronouncements on the number of businesses located on a water-dependent industrial estate, let alone the number of businesses using water-dependent facilities.

However, the GIS tool does allow the selection of industrial estates that meet specific surface area criteria (e.g. all estates larger than x ha).

4.2.2 Proximity to other BTMO’s

Information on the proximity of other BTMO’s can be used in the following way:

- adjacent plots can be used as part of the expansion of an existing BTMO;
- BTZO’s in the area can be used to encourage shared use.

The GIS tool enables the drawing up of criteria for the selection of industrial estates in the vicinity of water-dependent estates.

4.2.3 Type of waterway

This study shows that BTMO’s are most common along larger waterways. This does not alter the fact that De Vlaamse Waterweg actively promotes the use of smaller waterways. The development of new estates must therefore take into account the pursued objective.

The GIS tool allows targeted selections to be made per type of waterway.

4.2.4 Regional land plan

The regional land plan of any estate can be requested in the GIS file. In most cases, the zoning of a non-water-dependent estate is compatible with a water-dependent development, but not always. It was deliberately chosen to leave this open, because in certain cases the zoning of the regional land plan can be changed.

The GIS tool makes it possible to combine information from the industrial estates with input from the regional land plan.

4.2.5 Existing access

The term ‘access’ refers to both the road and the quay infrastructure. In addition to data that can be obtained via the district, field research is required in order to be able to make a correct assessment of the existing situation and the way in which it can/should be improved.

4.2.6 Responding to future spatial developments

To what extent does the existing offer of BTMO’s meet the expected future developments?

Regardless of whether an estate is actively used for transhipment or not, it is worth examining our “iron stock” of water-dependent infrastructure (in which we also include public quay walls) in light of future developments. This includes issues such as:

- project-based developments at De Vlaamse Waterweg NV (ROC’s[17], estate development, etc.);
- Inland Shipping 2.0 study;
- ENA;
- ENES;
- Distribouw within the framework of construction logistics;
- localisation of TOP’s, DOP’s and CGR’s (respectively Temporary and Final Storage Sites, Soil Cleaning Centres) within the framework of excavated soil;
- potential studies carried out by transport experts (Oude Briel, Leuven-Dijle Canal, Roeselare-Leie Canal, etc.);
- transport regions;
- regional logistics hubs.

This list can be further complemented by other studies and projects that benefit from a geographical approach, such as the Mineral Resources study.

4.2.6.1 Development projects of De Vlaamse Waterweg

Upon request, the current project developments of De Vlaamse Waterweg can be added to the GIS database.

For example, the GIS tool makes it possible to select industrial estates that fall within the sphere of influence of a ROC.

4.2.6.2 Inland Shipping 2.0

The Inland Shipping 2.0 study indicated per region where the greatest growth in water-related volumes can be expected. The results of this study can be used to determine where the future development of water-dependent infrastructure is of strategic importance.

This study also provides insights into the degree of completion of the BTMO’s.

4.2.6.3 ENA

[17]Regionaal Overslag Centrum [Regional Transhipment Centre]

Is a spatially coherent network of Flemish municipalities situated along the Albert Canal. The objective of the network is to align the economic strengths of the area and to provide a structured response to economic growth.

4.2.6.4 ENES

The realisation of the Seine-Scheldt connection is expected to have a major impact on the growth of inland shipping volumes in East and West Flanders. Waterways linked to this project (Upper-Scheldt, Roeselare-Leie Canal, Leie, Ringvaart Gent) have the highest growth expectations[18].

4.2.6.5 Distribouw

Within the framework of the Distribouw project, the final report identified 14 geographical clusters with potential for the establishment of a Distribution and Consolidation Centre (D&CC). 11 fall within the scope of Waterwegen en Zeekanaal:

- Aalst/Dendermonde
- Antwerp
- Bergen/Charleroi
- Bruges/Ostend
- Brussels/Halle
- Ghent
- Hasselt/Genk
- Kortrijk/Ieper/Roeselare
- Luik/Verviers
- Mechelen/Leuven
- Turnhout

[18] Source: Inland Shipping 2.0

Figure16: Clusters for D&CC expansion (Source: Distribouw study)

The GIS tool enables the targeted approach of businesses/industrial estates within such clusters.

4.2.6.6 TOP's – DOP's – CGR's[19]

The GIS tool can also be enriched with water-dependent solutions that are available for earthmoving projects. The earthworks study (2012) already contains a survey map with all the approved soil sanitation companies, but this map can be both updated and refined. For example, it could be mapped out which earthmoving contractors have access to water, and actively use it.

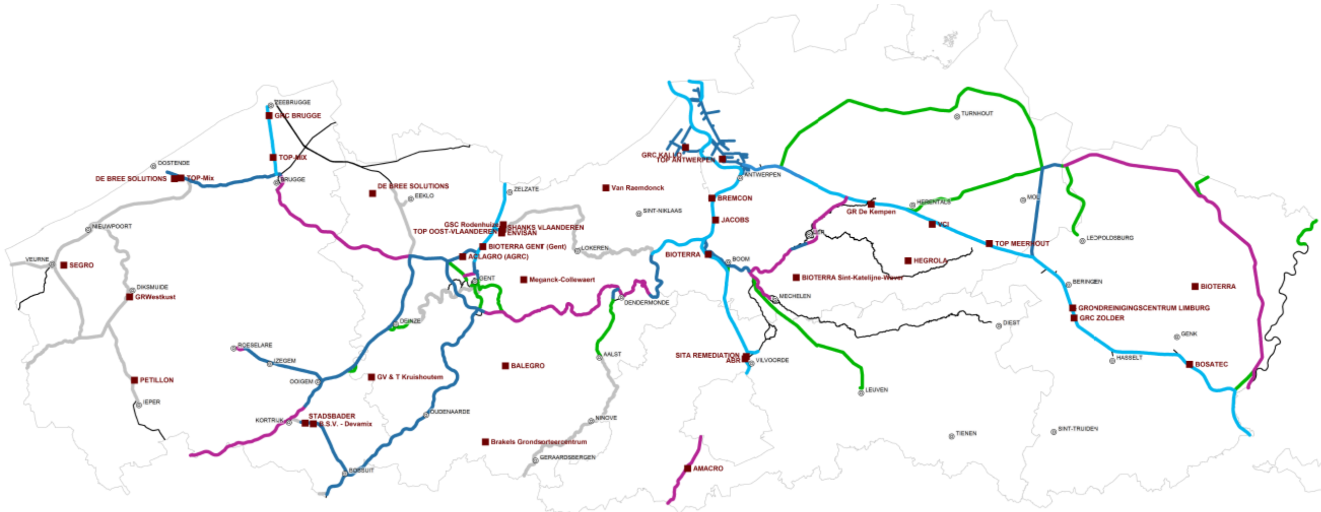


Figure 17: match of waterways and approved soil sanitation companies (based on the 2013 soil specimen bank's list)

[19] TOP Temporary Storage Depot – DOP = Final Storage Depot – CGR = Centre for Soil Sanitation

4.2.6.7 Potential studies

Transport experts have already carried out the following screenings over the past years:

- Baasrode (Briel);
- Kampenhout
- Wetteren;
- Bossuit Canal;
- Roeselare-Leie Canal;
- Brussels-Charleroi Canal.

The GIS tool allows for continued and targeted screening.

4.2.6.8 Transport regions

Whereas the focus of the mobility policy in Flanders was for a long time prominently on the municipal mobility plans, the transport regions are currently trying to approach this within a broader, more regional framework. This broader framework is not only municipal, but also cross-sectoral. The transport regions therefore present the opportunity to incorporate the assets of inland navigation in the mobility policy.

The GIS tool can be used to provide insight into inland navigation activities in Flanders, at both the Flemish level and at the level of the transport regions.

4.2.6.9 Logistics hubs

The study Regional Logistic Hubs (Tri-Vizor, 2017) defines, localises and characterises promising hubs for the concentration and compaction of logistic activities. This results in a map of opportunities for regional logistics hubs in Flanders.

The GIS tool can identify those BTMO’s that can develop water-dependent potential within these hubs.

4.3 Optimisation of existing BTMO’s

This study offers transport experts and file managers of De Vlaamse Waterweg the possibility to carry out targeted screenings of industrial estates, in combination with the research of Inland Shipping 2.0, in which, among other things, estates with a low degree of development were mapped out.

The BTMO’s can also be used to accommodate future spatial developments (discussed earlier in 4.2.6).

4.4 Criteria to determine additional public quay walls

A clearly expressed policy vision is required if we want to exploit the full potential of the existing public quay walls. The basic principles of such a policy were mentioned earlier in 3.3.

The following can be researched on the basis of this vision:

- which quay walls can be reactivated;
- are additional quay walls required?

This can be done on the basis of the following criteria:

- proximity of industrial estates (both BTMO's and BTZO's);
- proximity of other public quay walls/water-dependent industrial estates; which must feature a well-considered distribution;
- potential compared to expected developments (see 4.2.6)
- road access;
- local factors;
- potential study, field research

4.5 Determination of future tonnage potential

One of the conditions for investment in water-dependent infrastructure is the guarantee of sufficient tonnages. The question is how reliable, future tonnage can be determined.

In the case of PPP quay walls, the tonnage is linked to the amount of the investment, and thus to the subsidy. The longer, larger and more expensive the quay, the higher the investment and consequently the higher the tonnage commitment.

This question is also reflected in many studies, such as MOBERs (Mobility Impact Assessment), or studies that study certain aspects of modal shift. In these studies, key figures are used in which the number of movements is related to the surface area of the estate studied.

In this GIS study, tonnage was linked to each water-dependent industrial estate. There is strong temptation to use these data to calculate the future potential of an industrial estate. This could be done simply by calculating an average tonnage of existing estates and then extrapolating on the basis of certain criteria such as surface area and clearance. However, Chapter 3.2 has shown that some caution is needed. For example, the relationship between surface area and tonnage is not so clear-cut, and the type of business, activity and type of goods, all three factors that cannot be included in this study, also play a role.

If a future tonnage potential of a certain industrial estate is desired, we are more inclined to make use of a combination of sources:

- Top-down approaches based on macroeconomic trends and large-scale statistics.
- Bottom-up approaches, such as a screening of an existing industrial estate. These are based on the existing situation. The advantage of this method is that it takes into account the real, current context. The disadvantage is that it loses sight of macro-economic trends (growth, long-term developments).
- Models that allow for the targeted use of modal shift potential, such as the LAMBIT model.
- Studies that identify the potential of a specific economic sector, such as palletised building materials, or earthmoving.

5 CONCLUSION

This study provides interesting insights regarding the current water-dependent infrastructure in the operating territory of De Vlaamse Waterweg NV. Which estates are located by a navigable waterway and actually use this waterway? Which are the public quay walls, where are they located and how are they being used?

The study was performed in a GIS environment. The GIS analysis identified 496 industrial estates that are located by a navigable waterway. Just 1 in 3 of these estates have a link-up with the waterway, although it should be pointed out that this group of 157 estates does represent 70% of the total surface area of industrial estates bordering on waterways.

There are 42 public quay walls, nearly half of which are situated along the Maritime Canal and the Brussels-Charleroi Canal. Their utility varies greatly. Some have fallen into disuse, others may be reactivated provided specific interventions are carried out and a number of them are successfully used for goods transhipment activities. Around 40% of these quay walls are located in an industrial estate, the remaining 60% are not.

FRISbi also enabled us to assign a transhipment tonnage to each industrial estate and public quay wall, in the awareness that hitherto this exercise could only be performed for businesses that have concluded one or other tonnage commitment (PPP, support measure, concession) with De Vlaamse Waterweg.

The GIS environment in which the present study was conducted also allowed us to bring a number of spatial insights into clearer focus, notably the connection between estate surface area and tonnage, or the role played by the size of the waterway.

The know-how gleaned through this study may deliver substantial added value for other water-dependent projects and assignments (especially when combined with studies such as Inland Shipping 2.0, Distribouw, earthworks, etc.) in general, and the development of a targeted policy in favour of inland navigation and modal shift in particular:

- Which BTMO's can be used more efficiently, both in terms of the number of businesses that use the infrastructure and in terms of the proportionate land take rate of the total estate surface area (to be combined with Inland Shipping 2.0)?
- Which industrial estates without transhipment infrastructure need to be given transhipment infrastructure as a matter of priority?
- Which estates, both water-dependent and non-water-dependent, can play a part in a specific future development – ENA, ENES, Distribouw, earthworks, etc.
- Which BTMO's can help shape transport regions and regional logistics hubs?
- How do we deal with the existing public quay walls in times to come? Which quay walls would do well out of being reactivated? What is the intended spatial spread of the public quay walls?
- Should the existing network of public quay walls be expanded? If so, based on which vision development?
- This study can also serve in support of a targeted, proactive land acquisition policy, e.g. as part of the expansion of a water-dependent industrial estate.

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