5 Mapping promising Twin hub regions

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5.1 Introduction

This chapter is focussed on the mapping of transport flows that are relevant in the process of identifying promising bundling networks, which is the subject of chapter 4. In view of identifying promising bundling networks the aim of this transport flow analysis is to find transport relations between seaport and hinterland regions that have too small volumes each to fill a train, but would have sufficient volume to run a train if the load units are bundled with load units of another seaport that are destined to the same hinterland region. In other words, the envisaged result of this research activity is to have a list of regions that potentially can be served by the Twin hub network. The chapter describes the approach that was followed in this transport flow analysis and presents its results.

In the framework of analysing transport flows Zeeland Seaports also performed an analysis of its potential flows that would be suitable for a modal shift from road to rail. The aim of this analysis was to explore if there could be possibilities to develop a spoke service from the seaport region of Zeeland to the hub region (Antwerp or Rotterdam). The results of this analysis are summarized in Appendix 2.

5.2 Approach

5.2.1 Defining the target market

A major starting point for the analysis was the definition of relevant flows to consider. Since the target market for Twin hub train services consists of flows that are too small to enable a train service from an individual seaport, these flows will be currently transported by road. The potential market for Twin hub services has therefore been defined as transport of intermodal load units by road.

The majority of intermodal loads that arrive and leave the seaport are containers that are deep sea related, i.e. they are the land leg of a transport chain that involves deep sea transport. These container flows are known as maritime intermodal flows. In addition, there is transport of intermodal load units (i.e. containers and swap bodies) between the port and hinterland which is not deep sea transport related and has its origin or destination at companies that are located in the port region (so called continental transport). Both these maritime and continental flows are included in the target market.

The possibility that volumes which are currently transported by barge in the hinterland of Rotterdam and Antwerp could be a target market is excluded. Barge transport has a very strong position in the hinterland transport market (in particular because of its low rates) and hence it is not likely that rail transport can strongly compete and capture market share of barge transport.

Short sea shipping is also a cost competitive transport mode. However, as hinterland transport is concerned, short sea shipping is rather expected to be complementary to rail transport than competing with this mode. Rail transport, however, can become a competing mode for short sea shipping for very specific continental intermodal flows (i.e. where rail transport through the Channel can be an option).

5.2.2 Criteria for promising transport volumes

Hinterland regions that, based on their transport volume, are potential promising to develop a Twin hub train service are regions for which the road container flows from Rotterdam and Antwerp together are sufficiently large to implement a train service. 'Sufficiently large' means that it enables a train (of 600 meter length) to run break even when it has a frequency of 3 departures per week in both directions. Conform preferences of shippers a frequency of 3 train services per week can be defined as a minimal frequency that is required to offer an interesting alternative to road transport. In order to run 'break even' the train should have an average loading degree of about 80%. Hence the joint volume between the seaports and a hinterland region that is needed to run a train is about 20.000 TEU on annual base. An additional criterion is that the volume in one direction is at least 6.500 TEU. If not, the imbalance of flows will be too large to run a train break even. Since it is unlikely that all road container flows will shift to rail when a train service is introduced it is clear that 20.000 TEU should be considered as a threshold volume for regions that may be interesting to develop a new train service. The actual road transport volume in a region that can be captured by rail depends on the competitiveness of rail to road transport to that region. A modal shift analysis is needed to assess the real volume of road containers that may shift to rail transport.

5.2.3 Geographical focus of the analysis

A first step in the demarcation of the geographical scope of the transport flow analysis has been the definition of relevant European corridors that include the Dutch and Belgian seaports (notably Rotterdam and Antwerp). First of all, these are the corridors that begin or end in the seaports of Rotterdam and Antwerp and cover the following directions South (France, Spain, Italy), Southeast (Switzerland, Austria), East (Germany, Poland and Czech Republic), North (Sweden) and West (United Kingdom). In addition, there are the corridors that concern freight flows that do not begin or end in the Dutch or Belgian seaports, but in which the location of seaports of Rotterdam and Antwerp offers opportunities to bundle flows in these corridors with those in the corridors in which Rotterdam or Antwerp are begin or end point. From this point of view the most relevant corridors that have been selected here are the corridors United Kingdom (England) – Germany/Poland and United Kingdom (England) – France.

A next step in the process was the definition of regions. The transport flow analysis should be performed at a disaggregated level, i.e. a regional level, to enable conclusions about potential train services. On the one hand two port regions, i.e. Rotterdam and Antwerp, had to be defined and on the other hand the regions in the hinterland. It is clear that the definition of a region relates to what is considered to be the service (catchment) area of the terminal in that region regarding to the attraction of flows. The larger the regions are defined, the larger the transport flows will be, but in a greater region the transport volume is in principle more dispersed. As a consequence the average pre- and post-truck haulage distance increases, which makes intermodal rail transport less cost competitive to road transport.

In defining the regions the availability of transport flow data had also to be taken into account. Data could be obtained at the so called NUTS 3 level, which is the lowest administration level that is commonly used in EU-wide statistics. The availability of

data for NUTS 3 regions enables to aggregate data to a higher level (e.g. NUTS 2) and hence flexibility in defining the size of regions.

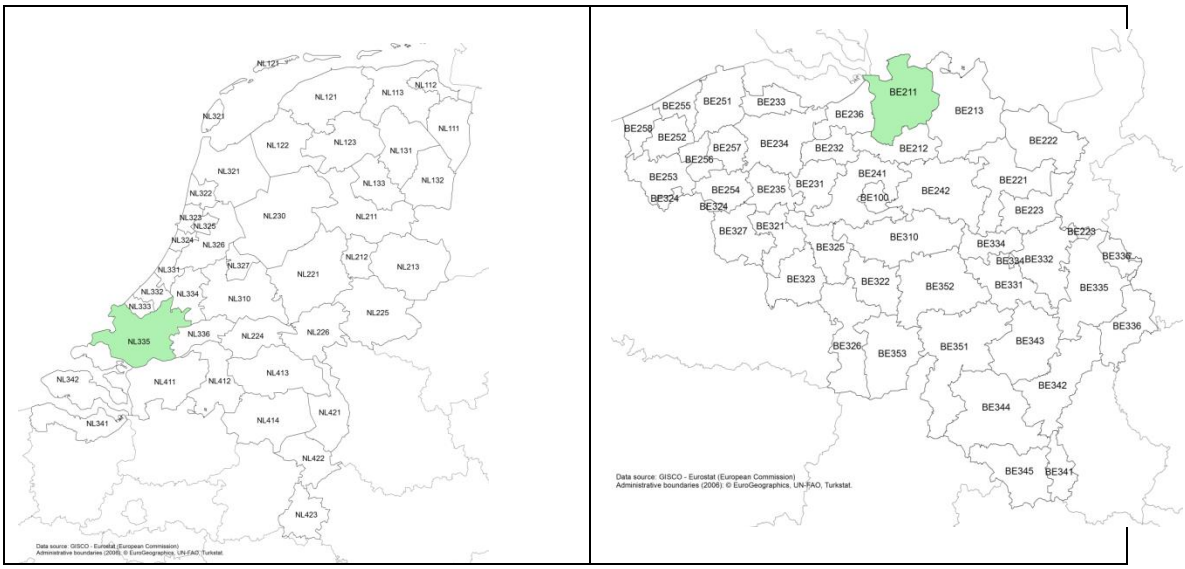
With respect to the size of port regions two scenarios have been elaborated: 1) small port regions and 2) large port regions.
Small port regions: the size of the region is limited to the port areas of Rotterdam and Antwerp. These areas include all container terminals (deep sea and rail terminals) of the seaports as well as the major clusters of port companies that generate transport in intermodal load units. The majority of intermodal load units that arrive and leave from these regions to the hinterland regions consist of maritime containers (i.e. the land leg of a deep sea transport chain). In addition, there are the inbound and outbound flows of intermodal load units that have no relation to deep sea transport (the continental flows) and which are generated by the companies located in the port area. The port area of Rotterdam consist of the NUTS3-region 'Groot Rijnmond'. The port area of Antwerp covers the NUTS3-region 'Arrondissement Antwerpen' (see figure 5.1).
Large port regions: the motivation to define also larger port regions is that the catchment area of rail hub terminals in the port of Rotterdam and Antwerp may exceed the borders of their own port areas. Whether it can be cost effective to deliver a container over a relative large distance by truck to a rail terminal in Rotterdam or Antwerp will largely depend on the rail distance of the train service into the hinterland. The larger the rail distance the larger the pre- and post-truck haulage can be.
The large port region of Rotterdam covers the West- and Southwest of The Netherlands. The large port region of Antwerp covers partly the province of Vlaanderen and the province of Brussels (see Figure 5.1).
In this scenario of large port regions the inbound and outbound flows will be larger than in the scenario with small port regions. The larger flows are the result of additional continental flows.
Concerning the size of hinterland regions two geographical levels have been included, the NUTS2- and NUTS3 level. Table 5.1 shows the number of regions at different geographical levels.

Table 5.1 Number of regions per country at different geographical levels (NUTS1, NUTS2 and NUTS3)

Country	NUTS 1	NUTS 2	NUTS 3
Germany	16	39	429
Poland	6	16	66
Czech Republic	1	8	14
France	9	26	100
United Kingdom	12	37	133
Austria	3	9	35
Switzerland	1	7	26
Italy	5	21	107
Spain	7	19	59
Sweden	3	8	21

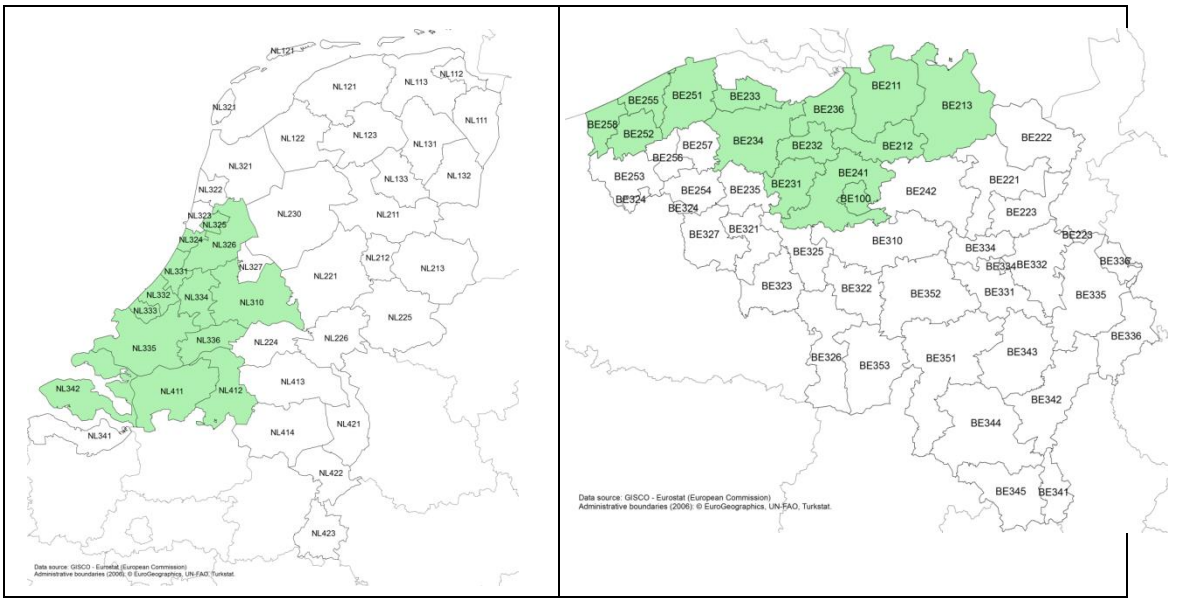
Source: derived from Eurostat, 2007.

Figure 5.1 Small port regions of Rotterdam and Antwerp



Source: drawn by Meijers, TUD-OTB

Figure 5.2 Large port regions of Rotterdam and Antwerp



Source: drawn by Meijers, DUT

5.2.4 Data availability and preparation

The specific data needed for the transport flow analysis concerns data that is not directly available at statistical offices like Eurostat. The common procedures to develop statistics regarding road transport do not allow to obtain data on such a low geographical level. Therefore it was needed to estimate these freight flows. This is a task that has been performed by Panteia.

Two main data sources have been used from the ETISplus project (http://www.etisplus.eu). These contain trade data and transport data respectively for

the year 2010, being the most recent year for which the dataset could be constructed. These sources are complementary and can both be used to assess freight volumes.

Data have been constructed in two steps:
Step 1: Select the transport flows which are related to the study area from ETISplus transport data
Step 2: Estimate the percentage of the container transport flows per transport mode, i.e. road transport
The transport matrices contain information of goods flows per mode of transport. The metadata are available via the share point site:
http://www.etisplus.eu/data/MetaData%20Documents/D6%20Report-%202010%20Database%20and%20Methodology/05-D6-Final-V1.3-CH19-CH28%20W97.pdf

In view of the scope of the Twin hub project the road freight flows should consist of unitised transport (cargo in intermodal load units) covering containers, swap bodies and piggy back units. As regards the maritime flows (land leg of deep sea chains) the containerisation rate is known from statistics, but this is unknown for continental flows. Containerisation rates have been derived from the trade statistics of the involved countries. A containerisation rate per cargo type (defined per country-to-country relation) is used to transform ‘cargo in tonnes’ to ‘number of TEU’. A consequence of deriving the total unitised freight flows for road in this way is that it is not possible to make a distinction between the maritime and non-maritime (continental) flows.
The data reflect the transport performances of EU-27 transport companies only. It is unlikely that this leads to a biased estimation of flows, because the majority of road transport companies that are active in the corridors that were defined are from the EU-27 countries.
Furthermore, the data relate to cargo transport only: no transport of empty containers. Data on empty container flows are available at country-to-country level only. In road transport about 15% of all containers transported internationally are empty. Although empty road containers may also form trainloads for Twin hub trains it is not opportune to include empty containers in the target market. The development of a new train service would rather be based on cargo flows than empty containers, in particular because empty container transport is a very volatile transport business.

5.2.5 Structured process to find promising regions

The selected countries for the analysis contain many regions, particularly at NUTS 3 level and for the countries of Germany, United Kingdom and France (see table 5.1). Moreover, there are large differences in the size of regions between the countries. A region of NUTS 3 level in a large country may have about the same size as a region at NUTS 2 level in a small country. Due to the large number of regions it was decide to take a step by step approach: peeling the potential promising regions by looking first at the threshold volume (20.000 TEU) for the regions at NUTS 2 level and as a next step at NUTS 3 level. Evidently it is needed to take somehow the real size of a region into account when assessing whether a region is promising in generating transport flows.
An additional important argument for this peeling approach was the fact that not only the flows between the seaport regions and hinterland regions had to be mapped, but also continental freight flows between hinterland regions (e.g. UK and Poland) since

such flows could be bundled as well with the inbound and outbound flows of the seaport regions.

5.3 Results

In order to identify promising regions to which Twin hub train services could possibly be developed the container road transport flows between the (small) port regions of Rotterdam and Antwerp on the one hand and the regions in the hinterland on the other hand have been mapped. The mapping of flows initially focussed on the small port regions (NUTS 3 level). Choosing for the small port regions implies a conservative approach in estimating the size of the flows. The considered size of the hinterland regions is the NUTS 2-level.
As regards the East corridor regions in Germany and Poland showed substantial road container volumes, while regions in the Czech Republic did not. As the other corridors are concerned Italy appeared to have one region exceeding the threshold volume of 20.000 TEU, while France has several promising regions. The distinction between promising and non-promising regions has been visualized in figure 5.3 for Germany, Poland and the Czech Republic and in figure 5.4 for France. The promising regions have container flows from Rotterdam and Antwerp that together exceed 20.00 TEU on annual base. These regions are darkly coloured in the images. The images clearly show that several regions have only potential for new train services if the volumes of Rotterdam and Antwerp are bundled. Furthermore, the images also make clear that the promising regions are predominantly found at the border regions of France and Germany. Moreover, those regions having the largest volumes are at the shorter distances from the seaports of Rotterdam and Antwerp. These observations confirm the general notion that transport volumes tend to get smaller if the transport distance increases, but there may be exceptions. For instance, the region of Slaskie in Poland had a volume of 23.000 TEU and Rhone-Alpes in France more than 26.000 TEU.

Figure 5.3 Container transport volumes by road (in 1.000 TEU) between the seaport regions of Rotterdam and Antwerp and hinterland regions in Germany, Czech Republic and Poland, 2010

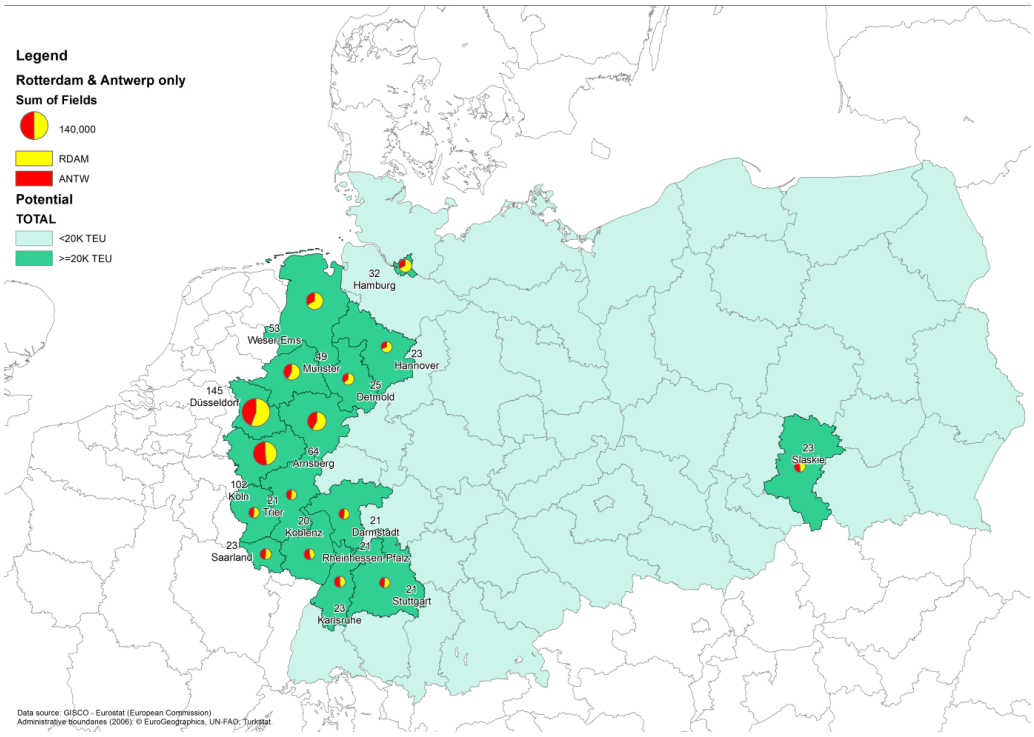
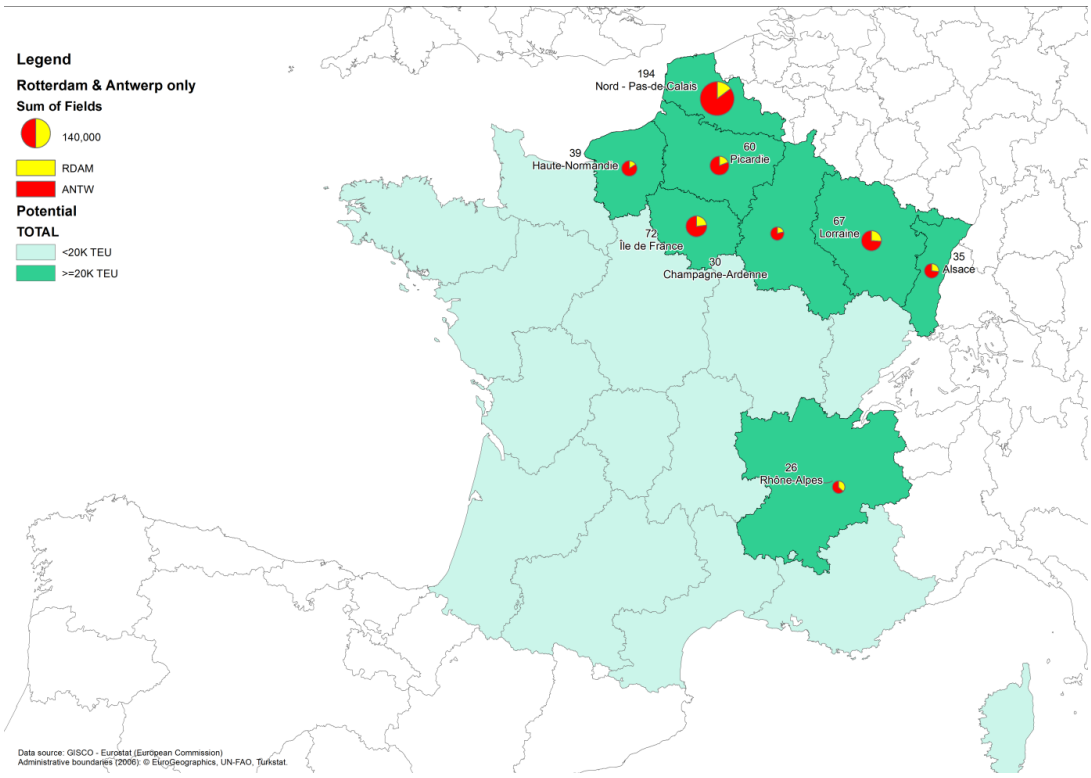


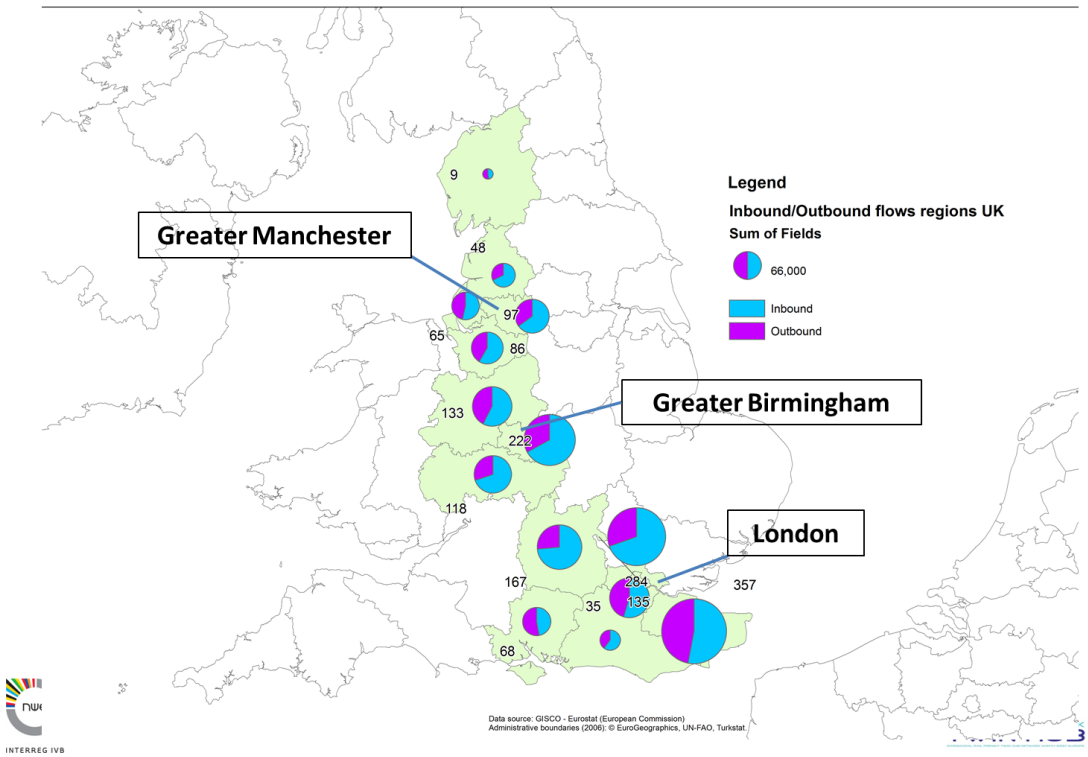
Figure 5.4 Container transport volumes by road (in 1.000 TEU) between the seaport regions of Rotterdam and Antwerp and hinterland regions in France, 2010



The Twin hub concept is primary focussed on hinterland transport, but the combination of maritime and continental flows can enlarge the scope and improve the performances of the concept. This holds for the core seaports in this study, Rotterdam and Antwerp, but even more for corridors in which the continental flows, so to speak, pass by Rotterdam and Antwerp, such as the intermodal flows between United Kingdom and parts of the European continent (e.g. Germany, Czech Republic and Poland).

To find potentially interesting regions in the UK concerning flows into the East corridor (Germany, Czech Republic and Poland) the following steps have been taken. A first selection consisted of only regions in England. Next the total inbound and outbound flows of these regions at NUTS 2-level have been mapped to find major cargo attracting and generating regions. Following this step the flows were looked at more detail (i.e. NUTS 3-level) and, in addition to flow size considerations, the possibilities of competition from the short sea shipping chain in linking these UK regions with the ports of Antwerp and Rotterdam were considered. That is to say, UK regions at a distance from a UK seaport were considered to be more promising for a train service (through the Channel) to Antwerp and Rotterdam[9]. Train services from these regions will be more competitive, because in the short sea shipping chain relative high pre- and post-truck haulage costs are involved. According to these criteria the following regions were considered as relevant for the analysis: Greater Manchester region (North West England), Greater Birmingham region (West Midlands) and London region (South East England).

Figure 5.5 UK regions that are potentially relevant for Twin hub train services



[9] In addition to the distance to the seaport also the importance of the UK seaport in the network of short sea shipping services was considered. In particularly, the seaports at the Eastside of England are much better embedded in short sea shipping service networks than the seaports on the Westside of England. Moreover, the sailing distance from the Eastside ports to Rotterdam and Antwerp is much shorter than for the Westside ports.

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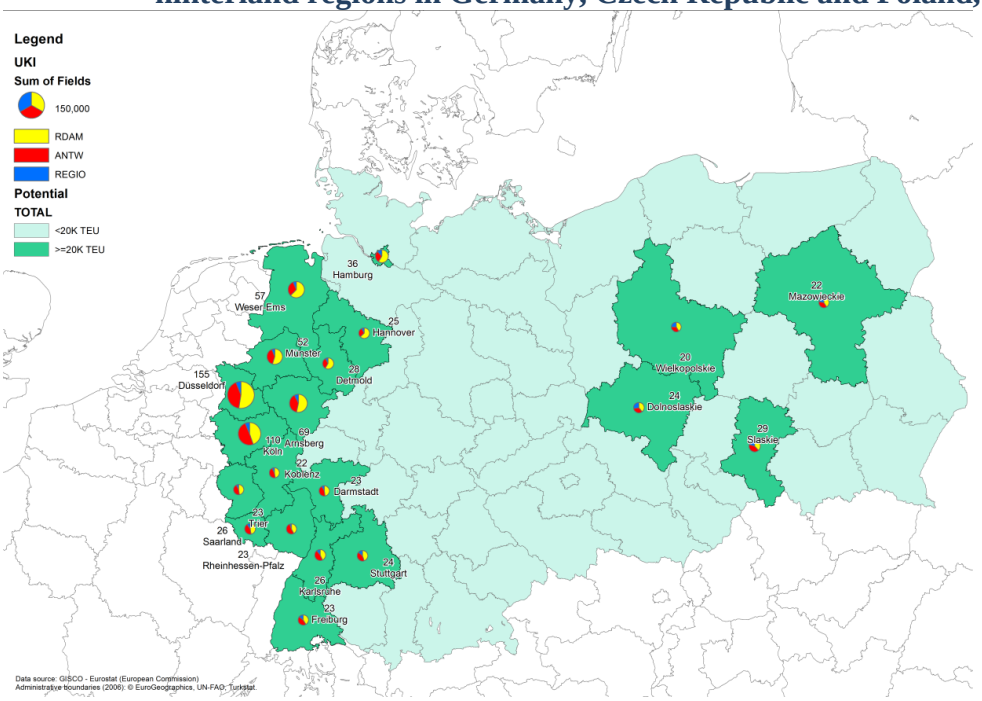
Including the flows of these UK regions results to an increase of promising regions and also to large volumes to the regions that were already identified as promising based on the combination of Rotterdam and Antwerp flows only. Combining the flows of the London region with the Rotterdam and Antwerp flows leads to the largest increase of flows. Figure 5.6 and 5.7 show the promising regions and their road container volumes when the flows of Rotterdam, Antwerp and London are bundled.

Figure 5.6 Container transport volumes by road (in 1.000 TEU) between the seaport regions of Rotterdam, Antwerp and the London region and hinterland regions in Germany, Czech Republic and Poland, 2010



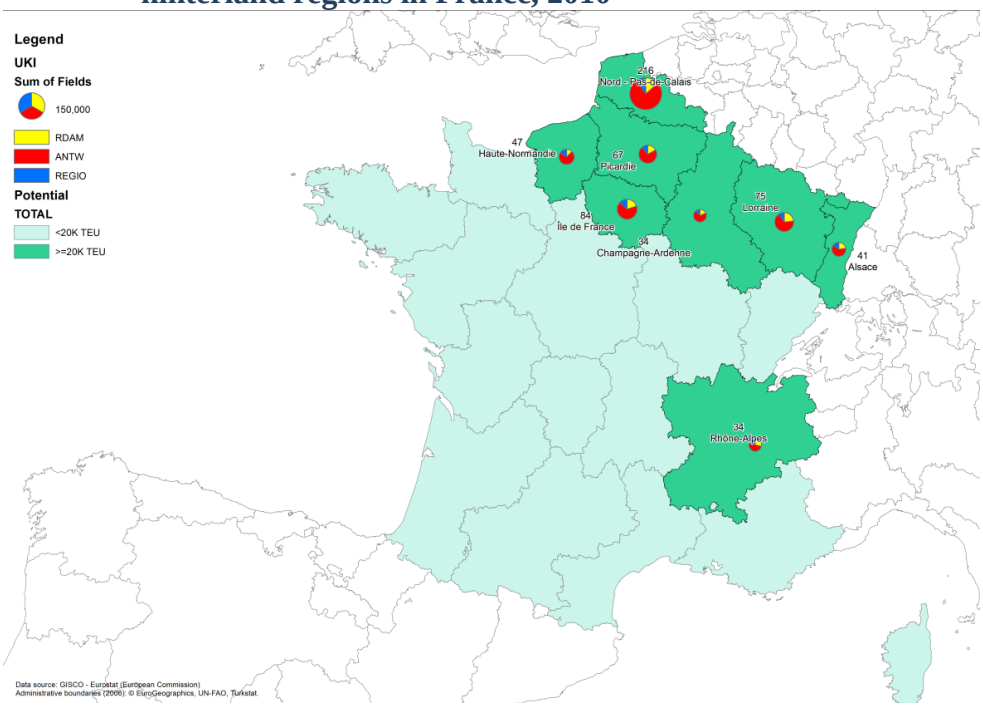
5.4 Conclusions

The aim of the transport flow analysis was to map intermodal transport flows between the seaports of Rotterdam and Antwerp and their hinterland to find hinterland regions that potentially can be served by a Twin hub network. The focus in identifying these regions was on road container transport (considered as the target market for new train services) and on flows in which the joint volume of the Rotterdam and Antwerp flows exceeds 20.000 TEU on annual base (being a threshold volume to enable a train service).

Accordingly, regions with promising transport volumes were found in:

- Poland: Slaskie.
- Italy: Lombardia.
- Germany: several West German regions (border regions).
- France: regions in North France and Rhone Alpes.

Figure 5.7 Container transport volumes by road (in 1.000 TEU) between the seaport regions of Rotterdam, Antwerp and the London region and hinterland regions in France, 2010



Next it was shown that combining these Rotterdam and Antwerp flows with flows form the UK increases the possible hinterland destinations for train services in a Twin hub network and also the viability of these train services, because of larger flows.
The findings regarding potentially promising regions are, however, only indicative as they are based on volumes of flows only. A cost comparison between intermodal rail transport and unimodal road transport is needed to define really promising hinterland regions to start new rail services.

Table 5.2 Volumes of bundled flows between seaport and UK regions and hinterland regions (x 1.000 TEU)

	R'dam + Antwerp	**R'dam + Antwerp + Manchester**	**R'dam + Antwerp + Birmingham**	**R'dam + Antwerp + London**
POLAND	Slaskie (23)	Slaskie (24)	Slaskie (26)	Slaskie (29)
			Dolnoslaskie (20)	Dolnoslaskie (24)
				Wielkopolskie (20)
				Mazowieckie (22)
FRANCE	Rhone-Alpes (26)	Rhone-Alpes (28)	Rhone-Alpes (30)	Rhone-Alpes (34)
	Alsace (35)	Alsace (36)	Alsace (38)	Alsace (41)
GERMANY		Freiburg (20)	Freiburg (22)	Freiburg (23)
ITALY	Lombardia (28)	Lombardia (30)	Lombardia (34)	Lombardia (40)