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# The UK domestic water transport system: an evidence review

Future of Mobility: Evidence Review

Foresight, Government Office for Science

# The UK domestic water transport system: an evidence review

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**This document is not a statement of government policy.**

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# Contents

# 1. Introduction

This short evidence-based review of domestic water transport offers some answers to the broader question: "What benefits/opportunities could the transport system of the future provide and what are the implications for Government and society?"

Based on desk research and data collection, this short, data-rich review describes the characteristics of the domestic water transport system, sketching the outlook towards 2040 and analysing the best practices both in short sea shipping (SSS) and inland waterway transport (IWW). SSS has been defined as all sea transport using one UK seaport (in the case of UK-Continent connections, also referred to as one port) or more than one UK seaport (UK internal sea transport, also referred to as coastwise) while not crossing an ocean. IWW has been defined as all water transport using rivers and canals inside the UK.

A more detailed discussion of the definition of SSS can be found in Annex C.

This review considers the outlook for domestic water transport towards 2040 and examines best practices. It reaches the following conclusions about the possible implications for decisions that must be made today.

- As a new relationship with the EU develops, the UK's domestic water system must be carefully analysed, and policies developed in response to that analysis.
- Clarity may be necessary on which water transport policy issues should take priority: for instance, should the focus be on scale, sustainability, automation, connectivity, fuel or electrification? The moment may also come when a decision has to be made about whether the UK wants to be a leader or a follower in certain policy issues.
- Certain types of best practice (such as being creative with load units, seamless Sea-IWW connections, dedicated vessels) require a more proactive role from government for success. Central government's coordinating role may be necessary so that regional and local governments do not have to 'reinvent the wheel'. Successful implementation of improvements such as better ICT systems can be lead by companies, but common data or software standards are easier with agreement by governments.
- In the short term, the focus might be on local/regional projects that have been proven in other countries. In the mid-term, a UK-wide coordinated approach (instead of bottom-up) towards waterborne infrastructure improvements (SSS, IWW, and ports) might be beneficial (Wilsmeier and Monois, 2013). In the longer term, connections with rail and the road network might be included.

# 2. Characteristics of the domestic water transport system

The UK domestic water system consists of Short Sea Shipping (SSS) and Inland Waterway (IWW) transport for both passengers and freight-enabling ferry services, coastal transport and container transport. The overall impact of the waterborne shipment of freight and the movement of passengers to the UK economy can be measured in a range of ways: the contribution to the overall UK economy; the number of people employed; freight volumes and passengers handled by domestic waterborne transport compared to other modes; and the investments made in the respective infrastructures.

The importance of the water transport system to the UK economy usually calls for a dedicated study. For a more general discussion of the relation between the economy and transport see, Transport and the economy: Third Report of Session 2010-11 (House of Commons Transport Committee (2011).

In 2016, 23,060 UK seafarers were active at sea; this statistic partly covers the employment figures for the UK water transport system, but further detailed study is required to disaggregate the respective segments for freight and passengers.

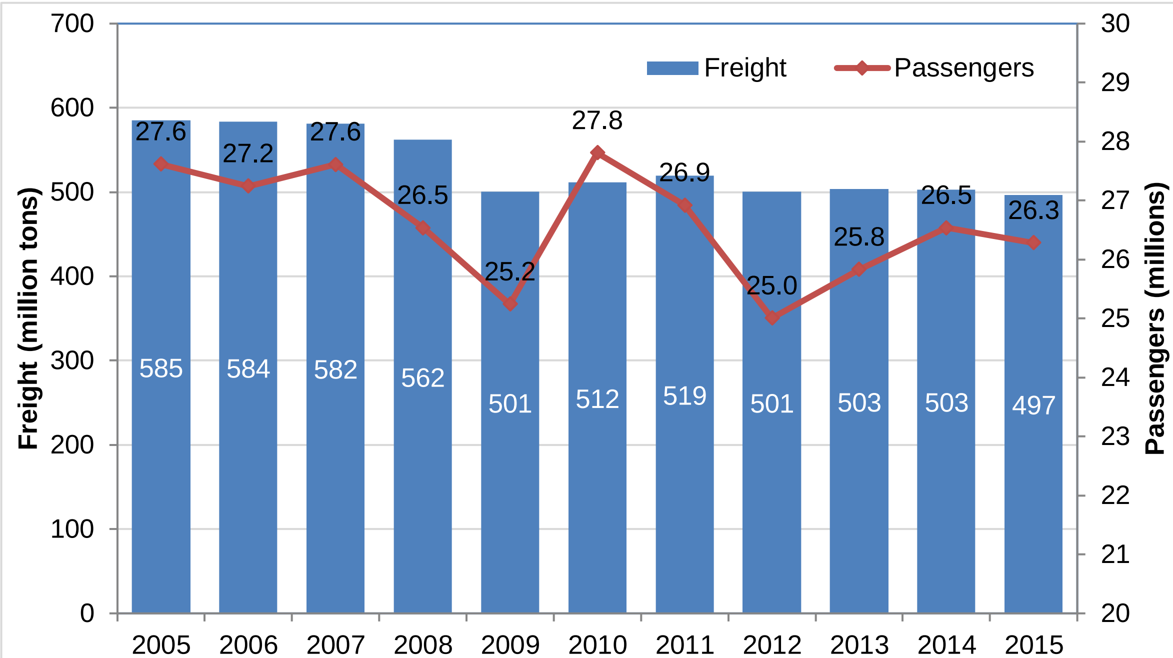
In 2015, 201 billion tonne-kilometres of domestic freight were moved within the UK of which 76% were moved by road, 9% by rail and 15% by water (DfT, 2017a). In 2016, traffic at UK airports totalled 268 million terminal passengers (arrivals and departures); and 20 million international short sea passenger journeys were made to and from the UK (DfT, 2017a). So, these figures suggest that for both passengers and freight, water transport is a serious alternative to air and road transport.

Turning to infrastructure investment, UK public expenditure on transport in 2016/17 was £29.1 billion, of which 5% was used to finance ‘other transport’, a category that includes the UK water system. National and local roads received 33% of the budget, rail received 54% and public transport received 8% (DfT, 2017a). These figures suggest that allocation of water transport infrastructure budget reflects the private sector nature of water-related transport in the UK and the focus on ensuring that effective hinterland infrastructure is in place to leverage the substantial investments made by the maritime sector.

The main characteristics and current flow patterns of the domestic water transport system is depicted in this review from a top-down perspective (from both the European and UK national levels).

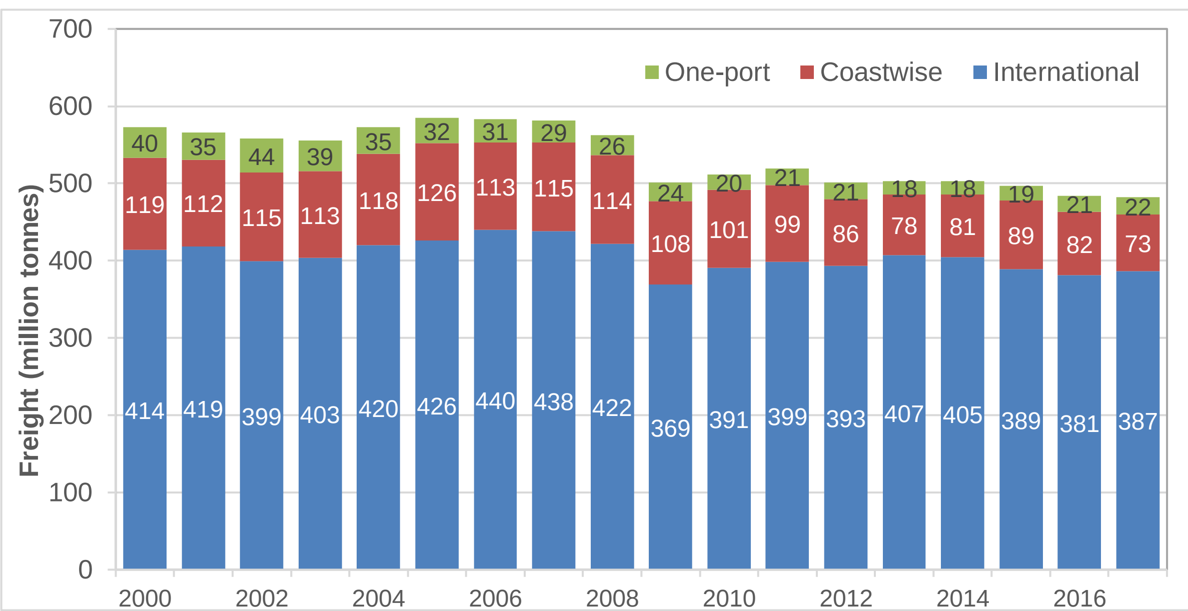
Figure 1 describes the development of freight and passenger flows for the UK. For both freight and passengers, the trend is decreasing slightly at both a national and regional level.

**Figure 1: Maritime freight and passenger transport, UK, 2005 to 2015**




Source: Eurostat

**Figure 2: Breakdown of maritime freight transport, UK, 2000 to 2017**

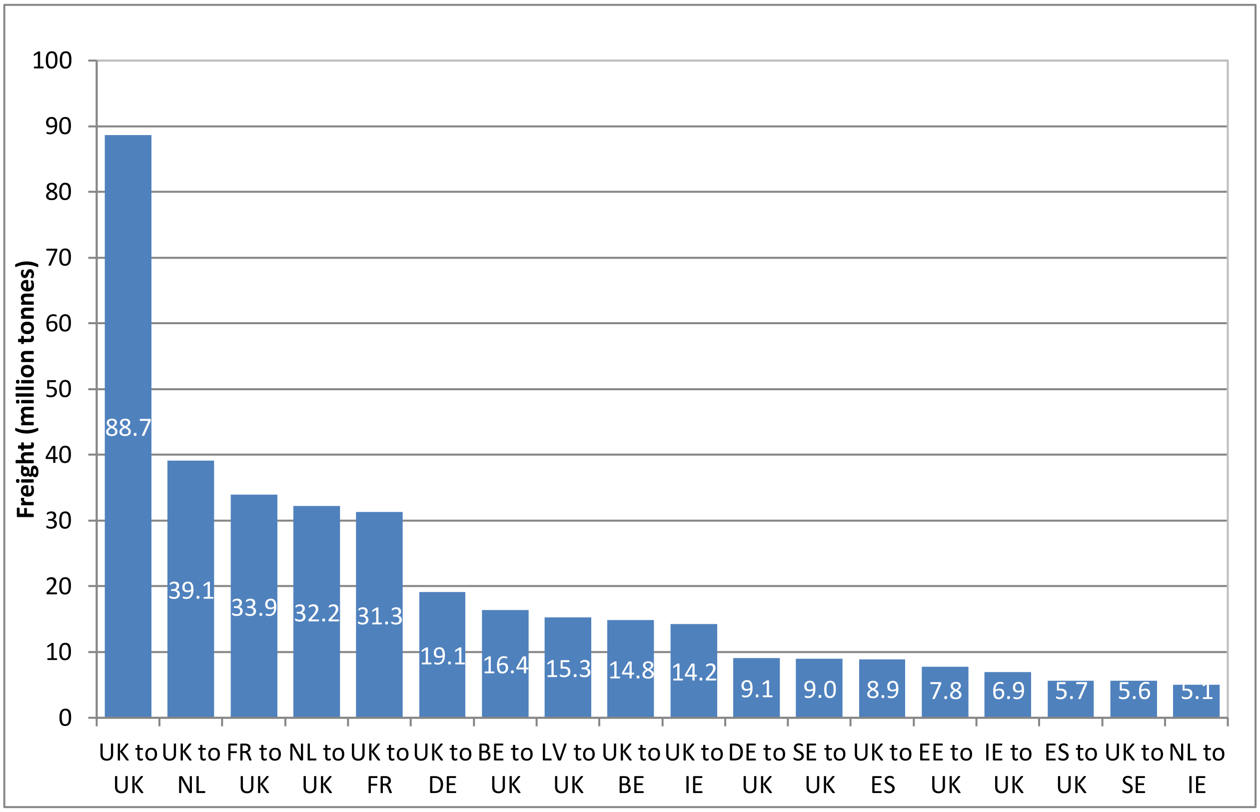



Note: SSS totals include One-port, Coastwise and Sea transport to and from the Continent (total unknown)

Source: Department for Transport Maritime Statistics

Figure 2 gives a breakdown of the maritime freight flows for One-port, Coastwise and International (both Continental and Intercontinental) categories. Figure 3 depicts the main sea routes that connect the UK and Ireland to the continent, giving an indication of the SSS services provided. Figure 4 depicts the domestic UK water transport network.

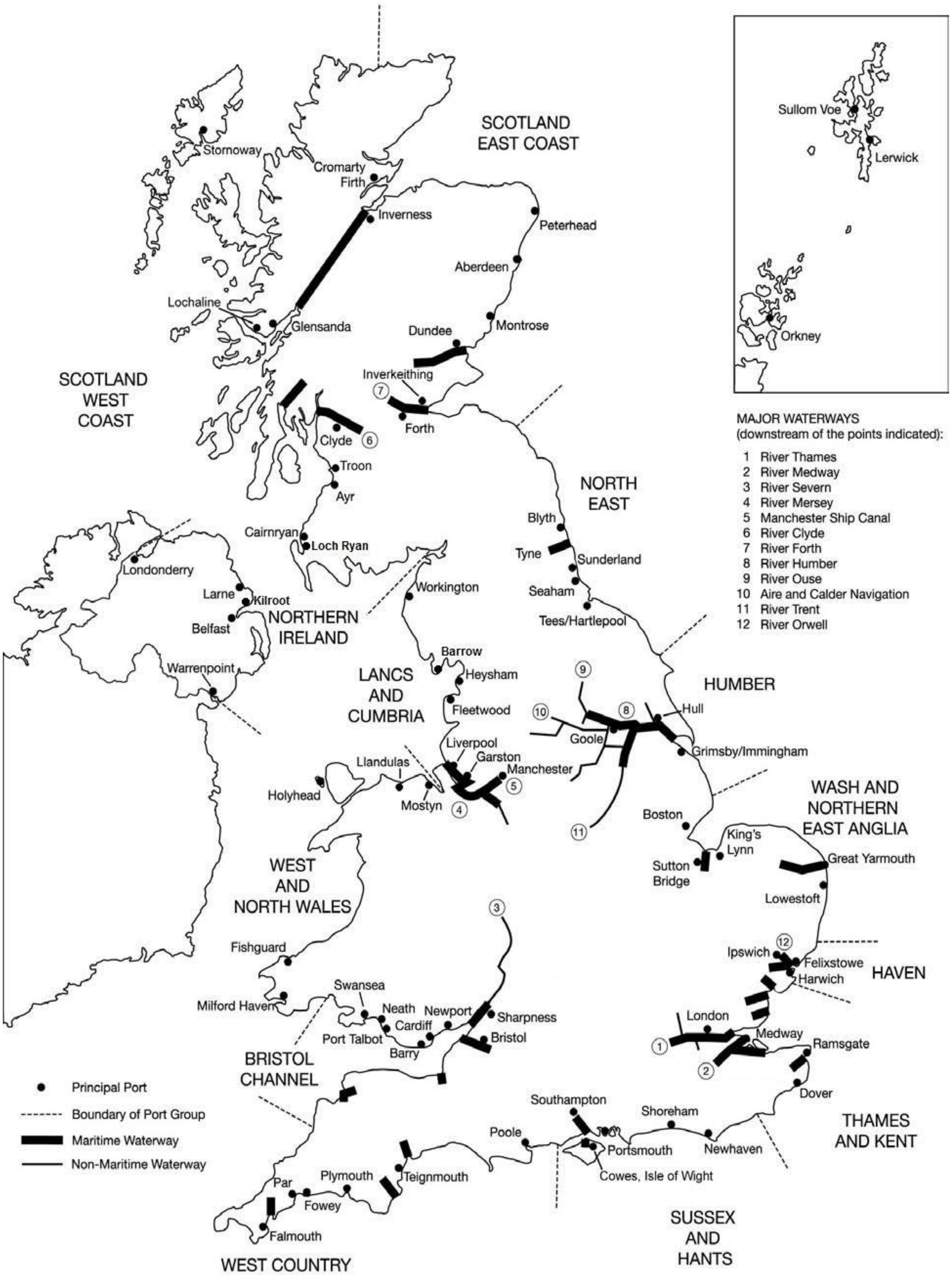
**Figure 3: Intra-EU maritime freight transport; selection of UK and Ireland routes, 2006**




Note: data from main ports only (ports handling more than one million tonnes per year); tonnes have been calculated by taking the declarations of the unloading ports (inward declarations) and adding those outward declarations of partner ports for which the inward declarations were missing.

Source: Eurostat

**Figure 4: Domestic water transport network**




Source: Department for Transport Maritime Statistics

Annex A, Figures D1 and D2, gives an overview that shows the most important UK container ports and their development in recent years. A trend of moderate growth in UK port container handling can be observed. This trend must be treated with care, however, as ports in Belgium and the Netherlands actually act as hubs for the UK. Parts of these volumes may enter the UK either by SSS transport, using smaller UK ports, or by truck and train. In the future, similarly, UK ports might act as transhipment hubs for Europe. Whether direct call or transhipped, this could represent an increase in containers entering and leaving UK ports.

Figures for UK ports reflect the trend of decreasing flows, although a limited number of relatively smaller ports show growth. Taken together, these tables and figures give a data-rich insight into the characteristics (port infrastructure and import and export flows) of the UK domestic water transport system for SSS and IWW. However, IWW transport in the UK plays – currently – a limited role (0.1% market share). This is partly due to there being few major commercial navigable inland waterways in the UK comparable to facilities on the continent, and the nature of their hinterlands – for example the Thames carries 56% of inland waterway traffic, as it forms an alternative to other transport in a congested urban environment, whereas that is not a driver in other inland waterway locations. When considered together with coastwise traffic, domestic waterborne freight accounts for 15% of total domestic freight transport in the UK (DfT, 2017a).

In recent years, the importance of the water transport system has decreased both in relative terms, due to the much faster growth of road transport, and also in absolute numbers. This trend has been partly fuelled by a severe drop in exports and a slight increase in imports over the last decade. The water transport system has also been changed by: scale increases; by the drive towards a more sustainable transport sector; by the excellent performance of single-mode road transport; by infrastructure developments (mainly ports); and by ICT and cooperation possibilities. It will be influenced by future trading relationships (Caris et al., 2014; Wiegmans and Konings, 2016; Raza and Wiegmans, forthcoming).

Closely related to these changes are a number of research gaps identified during this review, and which can only be resolved by evidence-based study.

- Sustainability: The effects of the drive towards sustainability seem to be mixed. Bergquist et al. (2015) and Panagakos et al. (2014) argue that sustainability regulation leads to a decrease in the market share of water compared to road. Others, such as Holmgren et al. (2014) and Zis and Psaraftis (2107) argue that little change should be expected in market share as a result of sustainability regulation.

- Performance: There is a lack of general insight into the performance of waterborne transport compared to single-mode road transport. Where performance is analysed, it is in most instances case-specific (for instance, Paixão Casaca and Marlow, 2005; Saldanha and Gray, 2002; Wiegmans and Konings, 2015). There is also a lack of detailed insight into the variables that influence modal shift decisions from shippers and consignees (Caris et al., 2014).

- Infrastructure: The impact and effectiveness of infrastructure improvements (ports, terminals, locks, bridges) are almost never evaluated (Raza and Wiegmans, forthcoming).

- Information: ICT possibilities and actor cooperation are often cited by the maritime sector as important but there are no concrete insights into the real, expected benefits of implementing more information-sharing in supply chains (Wiegmans et al., 2017).

- Future trading relationships: The expected effects of the development of new future trading relationships are unclear. The impact on location decisions and freight and passenger flows may be considerable (Caris et al. 2014).

These changes to the water transport system and the identified research gaps could have implications for port handling. Scale increases in water transport will also demand scale increases in port handling capacity (additional infrastructure and equipment investments). A change towards more sustainability (such as less $CO_2$, lower fine dust emissions, lower $NO_x$ emissions, lower noise and light nuisance) will also force port handling operations to respect these changing limits. Growing ICT possibilities and customer demand will also increase pressure on ports to offer these opportunities. If they do not respond, port handling capacity may be affected. Changing trading relationships may also place impact on port capacity and handling.

# 3. The domestic water transport system: outlook to 2040

The outlook for the development of the Domestic Water Transport System is a challenging because of the changing trading relationships with partners. These may not yet be fully incorporated in datasets. The value of the pound and our trading relationships will affect production locations and trade flows and have an important and strategic impact on the outlook towards 2040.

The influences outlined in Chapter 1 that have brought about change to the Water Transport System will continue to have an impact in years to come. A search for scale increase will continue to play a role as part of the drive towards lower costs. The drive towards sustainability will become more important, particularly pressures to reduce $CO_2$ and particulate emissions from all transport modes. This might improve the competitive position of the water transport system compared to the single-mode road transport system. However, the road transport system is also working to improve its sustainability and developments such as electrification and truck platooning might also improve its competitive position. ICT and cooperation possibilities offer considerable opportunities to move the Water Transport System towards better coordination and more integration, making it a more efficient transport system.

Transport system changes are mainly driven by supply conditions (such as infrastructure, innovations) and demand conditions (such as flow changes), and by regulation. Current trends in technology might lead to potential successful innovation such as automation, connectivity, sustainable fuels and electrification. These potential developments are considered in more detail below.

- Automation: In the water transport system, this focuses on the automated propulsion of smaller and larger vessels (Zheng et al., 2017). Coordinated vessel transport over water (water platooning) is also currently under study. One current H2020 project, Vessel Train, is part of the NOVIMAR project (NOVel Inland waterways transport and MARitime transport concept, 2017). Between now and 2022, it will develop a new transport concept for water transport based on platooning. A manned ‘leader vessel’ is followed by one or more ‘follower vessels’ with fewer crew or even uncrewed. The technological challenges are considerable and the technological cost can be considerable. Water platooning also requires considerable flows which might limit these developments in the UK to the river Thames.

- Connectivity: The use of ICT might deliver more efficiency and lower cost in domestic water transport. An important system is the River Information Services (RIS) which gives harmonised and standardised information exchange. RIS consists of Automatic Identification System (AIS) similar to that used by commercial ocean-going shipping, electronic messages, electronic cards, and notices to skippers. On certain parts of the European inland waterway systems, the use of AIS is obligatory. In the Netherlands, the government has paid for the implementation of the AIS on board Dutch vessels. In the UK, using ICT (although in a tailor-made approach) might also contribute to realising more efficiency and lower cost in domestic water transport.

- Fuels or electrification: The CLINSH project monitors 30 vessels, evaluating a range of emission-reducing techniques and alternative fuels. These include: diesel particulate filters (DPF); selective catalytic reduction (SCR); fuel water emulsion; hybrid technology; liquefied natural gas (LNG); and gas-to-liquid (GTL). Vessels will be monitored for at least two years.

- Sailing efficiency: Sailing and saving (VoortVarend Besparen; www.eicb.nl) is a program that encourages skippers and companies to practice efficient sailing behaviour. An 'e-learning' course teaches efficient, fuel-efficient sailing that reduces emissions.

- Cleaner fuels: Close to Rotterdam, a new multi-fuel bunker station for LNG refuelling and other cleaner fuels is planned (www.eicb.nl). Port of Rotterdam and Pitpoint.LNG signed a letter of intent to jointly further investigate the realisation of such a multi-fuel bunker station (see Figure 5).

**Figure 5: Illustration of multi-fuel bunker station**

# 4. Best practice: successful adoption of technological developments

This chapter presents best practices from technological developments adopted successfully in the water transport system in the UK or on the Continent (both for IWW and SSS modes of transport). In addition, successful projects in IWW and SSS are briefly described (Annex B offers a more detailed overview).

The following examples of best practices have been selected for discussion here:

**Offshore wind** has developed over the last five to seven years into a new segment where SSS plays an important role as a suitable transport mode. A potential success factor for offshore wind has probably been the suitability of SSS as transport mode and also the lack of a competing solution instead of SSS.

**Containers, steel and waste** also have several successful projects in the UK, Belgium, and the Netherlands. These three transport segments also show particular potential for transport by SSS and IWW because of the potential for high volumes and low transport costs.

Several projects demonstrate that **creativity with load units** offers potential. These projects include the sea transport of barges by a mother ship, the bulk transport of consumer goods so that packaging can take place as late as possible in the supply chain, and the seeking of opportunities for shared container usage to shared destinations. These projects are effective because they look for ways to transport the loads for as long as possible as a bulk commodity. Combining loads for certain shared origin and destination routes also contributes to the effectiveness of these projects.

Developing **seamless sea-to-IWW connections** also helps strengthen the competitive position of domestic water transport. Examples of successful projects include combined sea-river transport with dedicated vessels, and dedicated SSS-IWW terminals. What makes these projects effective is either the prevention of handling through a dedicated sea-river ship or increased handling efficiency and coordination at the combined SSS-IWW terminal.

In Alphen aan de Rijn (The Netherlands), the **Alpherium terminal development** was partly financed by Heineken. Heineken also provides a large part of the cargo volume. Beer for export is transported by barge from Alphen aan de Rijn to Rotterdam where it is taken on to its final destination by sea. This project is effective because it shares resources.

**Distrivaart** refers to the transport of palletised freight. In Belgium, for example, building materials are an important part of transported freight; however, in Utrecht consumer goods represent the majority of transported freight. These projects become effective through financial government participation and also when there is a certain level of market demand. Congestion in cities might help Distrivaart to grow further.

**Double-hull barges** absorb collision impact and increase the safety of barge transport (Wiegmans, 2005). This makes it possible for vessels to have larger cargo spaces. Another advantage is that such vessels have four tanks instead of six, reducing cleaning costs. The disadvantages are that repairs are more expensive and the heavier barges use more fuel. However, regulations that make double-hull barges the obligatory standard for all new vessels in some jurisdictions has ensured the success of this technology.

Several initiatives focus on **improving ICT systems** (for communication and navigation). At the European level, the River Information System (RIS) has been the most important initiative in the field and has been successfully implemented. Among the success factors may be financial support for the research that developed RIS, overall governmental support, and financial support from some governments put it on vessels (for instance, in the Netherlands).

**Dedicated vessels** are a multi-faceted phenomenon; almost every project is unique and difficult to duplicate. In the barge sector, several projects focus on the transport of special products by dedicated barges (Wiegmans, 2005). For example, the Mercurial-Latistar barge from Wormerveer to Nijmegen transported wheat. This dedicated barge could only transport wheat. It was later remodelled into a motor ship. Another example is a dedicated barge for the transport of bananas from Antwerp to Duisburg at a constant temperature of 14°C. The main reason for the success of this type of projects lies in the advantages to the participating company of decreased cost, transport reliability and sustainability.

# 5. Conclusions: implications for today's decisions

Based on this review of domestic water transport system characteristics, the outlook towards 2040 and current best practice, it is possible to identify a number of possible implications for decisions that must be made now.

The system characteristics taken together with system influences and the identified research gaps lead to the following policy pointers:

- Coordination benefits can be achieved between waterborne transport (SSS, IWW and ports) and other modes (Wilsmeier and Monois, 2013). In the longer term, it may also be beneficial to improve connections between water and rail and road networks.

- As future trading relationships develop, it is likely that volumes will change. Policymakers might choose to adopt a reactive posture to the evolution of these relationships.

The outlook towards 2040 suggests the following implications for decisions that need to be made today about how to deal with current technological developments:

- The influences of the new relationship with the EU on the UK's domestic water system must be carefully analysed and monitored in order to be able to optimise the policies.

- There are a range of influences on the water transport system, a number of research gaps, and several relevant technological developments. Policy makers may wish to prioritise the water transport issues that are to be the focus of their efforts; for instance, scale, sustainability, automation, connectivity, cleaner fuel or electrification.

- A range of policy options for regulating the UK's domestic water transport system might be identified, perhaps drawing on successful policies implemented in other countries.

- Certain aspects of the water transport system might also be jointly approached with other countries where the water system also plays an important role such as Belgium and the Netherlands.

- The development of scenarios for new trading relationships will help to decide certain policies and also inform the adaptation of certain policy measures if necessary.

The overview and selection of best practices suggests certain implications for decisions needing to be made today.

- First, certain transport segments such as offshore wind, containers, steel and waste are suitable for water transport and this should be encouraged.
- Other best practices (being creative with load units, seamless Sea-IWW connections, Alpherium terminal, dedicated vessels and Distrivaart) require a more proactive role from government to ensure their success. Because these example projects are so diverse, the UK government may need to co-ordinate projects at national level so that regional and local governments do not have to ‘reinvent the wheel’.
- Certain types of improvement, such as the improvement of ICT systems, may benefit from a coordinating or standard agreeing role from national government. In the UK, using ICT (although in a tailor-made approach) might also contribute to realising more efficiency and lower cost in domestic water transport.
- In the short term, the focus might be placed on local or regional projects that have proven themselves in other countries (or UK specific projects might be developed) as the impacts on future trading relationships remain unclear.

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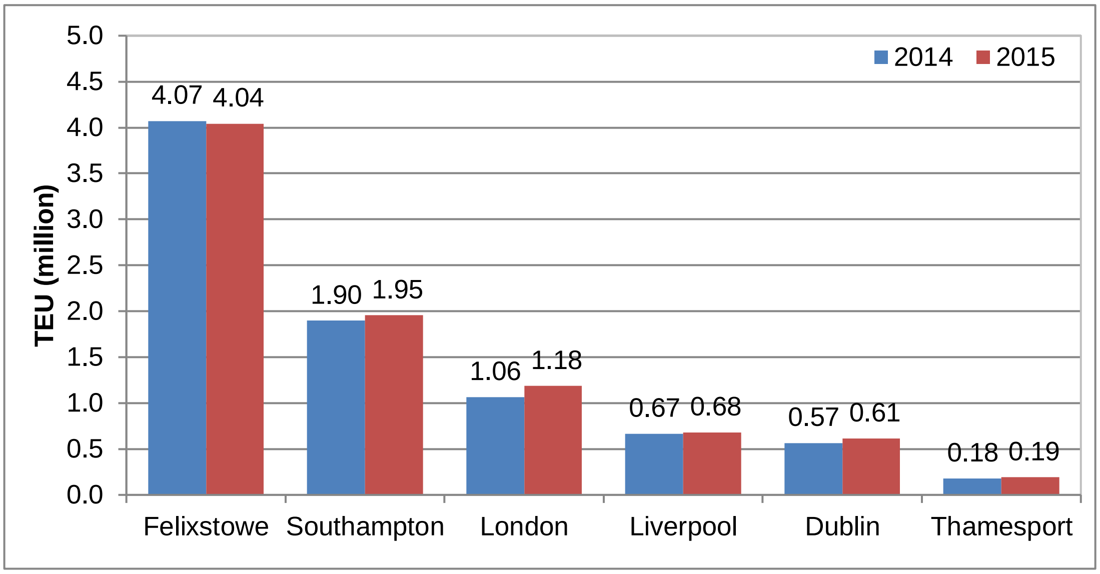
# 7. Appendices

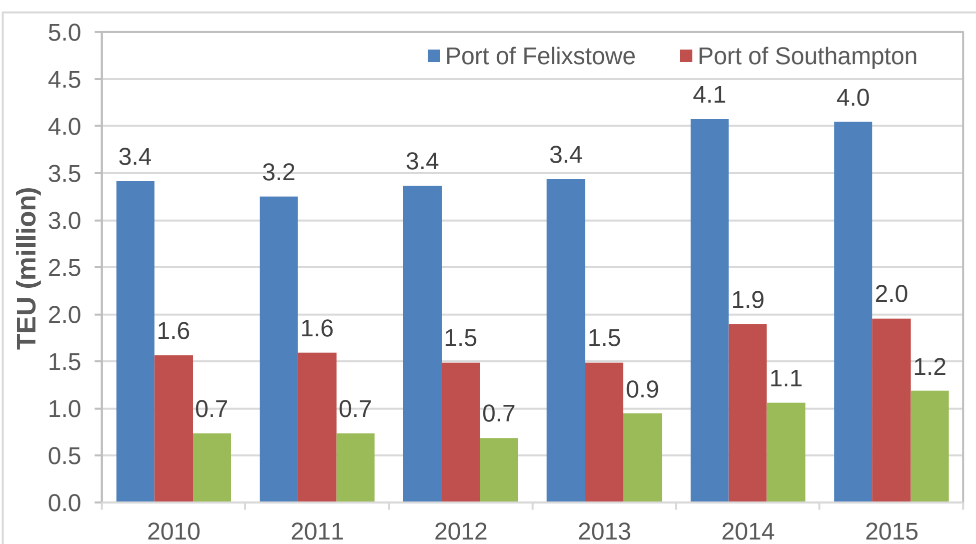
## Annex A: UK container ports

**Figure D1: Top UK Container ports in terms of volume of containers handled (in Twenty-foot Equivalent Units (TEU)), 2014 and 2015**




Source: Hafen-Hamburg

**Figure D2: Top three UK Container ports in terms of volume of containers handled (in TEU), 2010 to 2015**




Source: Eurostat

# Annex B: Best Practices

## Best Practices Overview, UK

Feederlink BV (FBP, 2010), runs container ships in a port rotation between Rotterdam and several UK ports.

Cemex construction materials (FBP, 2010), transports gravel and sand by the river Severn.

ASDA import centre at Teesport (FBP, 2010), feeder vessels transport import containers to Teesport and from there on distribution takes place saving road kilometres and improving reliability.

Sainsbury River Transport (FBP, 2010), consumer goods from warehouse to store(s) in Central London.

Cory Environmental (FBP, 2010), transport of waste along the River Thames from London to Essex by barge.

Westmill Foods (FBP, 2010), barges are transported by a sea-going mothership from the USA to the UK and then travel further inland into the UK. On the way back, Tata Steel ships engineered steel products bounded for Mississippi upriver destinations with these barges.

Abnormal loads (FBP, 2010), Concorde transported by barge down the Thames.

Short Distance Water (FBP, 2010), grain travels from Liverpool to flour mills in central Manchester.

Tesco’s Wine by Barge (FBP, 2010), ferry wine by barge from Liverpool to Manchester where it is bottled and packed for supermarkets.

Tata Steel (FBP, 2010) uses inland waterways in Europe and the UK for raw material and steel transport.

OOCL (FBP, 2010), deep-sea carrier offering feeder services.

K-Line (FBP, 2010), runs ships on a multi-port SSS service.

Days Aggregates (FBP, 2010), operates a number of terminals (rail and water) in the London area serving the construction industry.

Lafarge Aggregates (FBP, 2010), transports sand and gravel by barge.

MBNA Thames Clippers (FTA, 2016), transports passengers with a fleet that offers departures every 20 minutes from major London piers.

Revitalised ferry crossing (BW, 2004), ferry crossing for communities and tourists.

West Yorkshire LTP (BW, 2004), a range of mechanisms to take heavy lorries off motorways and put freight on rail or canal.

Waste on Water (BW, 2004), BW works with East Dunbartonshire Council at Twechar (Scotland) to develop a canal-side electrical goods reprocessing plant.

Lea Quarry (BW, 2004), sand and gravel go by barge from Denham along the Grand Union Canal.

Hackney's waste on water (BW, 2004), Waste from a specially designed collection vehicle is transferred direct to a barge, which then carries it up the River Lee Navigation to the disposal plant at Edmonton.

Connecting town and country (BW, 2004), often restoration of canals and pathways along the canals to better connect town and countryside.

Using waterways for passenger transport (BW, 2004), combinations of passenger boat initiatives on rivers and canals to attract visitors to a day out without their cars thereby also reducing congestion.

Developing a strategic approach (BW, 2004), country-wide plan for waterways regeneration and linking also to regional development projects.

## Best Practices Overview, the Netherlands

(from Wiegmans, 2005)

Fuel cells: the use of fuel cells may enable a considerable reduction of emissions and noise when compared with current motor technologies (Van der Laag and Mallant, 2002). Problems associated with fuel cells are cost, weight and size. Furthermore, fuel cell storage may be complicated (in the case of hydrogen or methane), and the performance of diesel is difficult to better.

Electric barge: Studies have been undertaken to analyse the potential for an all-electric barge (Prins, 2002). It has been concluded that an electric barge can transport 8–30% more cargo, it enables a fuel reduction of 10% (upstream) to 40% (downstream), it leads to lower emissions, and it enables a 15% reduction in per unit transport costs compared with current barge characteristics. A disadvantage is the higher costs that are associated with installing the motor (2.5%). Electric propulsion may be especially interesting for tankers (Bouw, 2003).

Barge motor performance: The performance of the barge motor (in terms of energy use and exhaust of gases) is influenced by depth, stream way, stream speed and loaded cargo (Dalpis, 2002). Many of the improvements that have been made to barge motors have been concentrated on reducing emissions. European policy has increased the regulation of the performance of barge motors and will continue to do so for the years to come. A large step may come from the SCR-catalyst that can bring emissions of nitrogen oxides to $< 3$ g/kWh. (Bureau Voorlichting Binnenvaart, 2017).

Propellers: The propellers and propeller traction have strongly improved. An example of such an improved drive system and improved propeller is the recently introduced Z-drive. A Z-drive has special wheels at the transfer point and two propellers instead of one and has been built in order to increase the manoeuvrability and the motor energy use performance (5–8% is mentioned). Another advantage of the Z-drive is that it does not produce much noise (Laros, 2003). In the Netherlands, so far no barges with Z-drive have been built. In Belgium, they have been introduced, but the results in terms of realised motor performance and noise level are not publicly known.

Tempomaat: A few years ago, Technofysica developed the 'advising tempomaat'. The tempomaat calculates the most efficient motor use with a number of variables (fuel use, tides, stream speeds). It provides advice on the route and speed to ensure the arrival of the barge at the agreed time, and a reduction in fuel use between 4 and 12% might result. This innovation reduces costs and emissions (Green Car Congress, 2008, Richard, 2008).

Air lubrication under the barge is another innovative way to reduce the fuel use of barges. Claimed reductions of fuel use are as high as 20% (Vereniging Nederlandse Scheepsbouw Industrie, 2003). Overall, the fuel efficiency that might be realised by air lubrication is in the order of 6% (Van Heerd and Thill, 2002).

Double-hull barges: absorb collisions, and therefore increase the safety of barge transport (Wiegmans, 2005). The improved safety means it is possible to have larger cargo spaces. Another advantage is four tanks instead of six, resulting in reduced cleaning costs. The disadvantages are that repairs are more expensive, it uses extra fuel, and the barge is heavy. The main important reason for this technology being successful was that it was accompanied by regulation (forced adoption) for newly built vessels.

Distrivaart is a project that is developing a national network in the Netherlands to transport palletised goods on barges between distribution centres and supermarkets. The ideal situation would consist of 40 barges transporting pallets between 17 distribution centres. This would eliminate 43 million pallets from the roads. Furthermore, it is claimed that it would result in a cost decrease of 20%. Similar road-based network initiatives claim improvement of lead times and lower transport costs (Kia et al., 2003). Pallets are shipped by River Hoppers capable of transporting 520 pallets (1.20 × 1.00 m), each hopper replacing the capacity of 20 truck combinations. Several companies have taken advantage of the opportunities of Distrivaart. Among these companies are Heineken/Amstel, Bavaria, Grolsch, Coca-Cola, Albert Heijn and Schuitema. A smaller version operates in the city of Utrecht and is called the Bierboot (Gemeente Utrecht, 2017). Also in Amsterdam a study is taking place into city logistics by water (http://mokummariteam.nl/).


Several initiatives focus on improving ICT systems (communication, navigation). On a European level, the River Information System (RIS) has been the most important initiative in the field and has been brought to successful implementation. Reasons for the successful implementation might be financial support of the research needed for the development of the RIS, overall governmental support, and financial support for the implementation on vessels (e.g. in the Netherlands).

Dedicated vessels are a multi-faceted phenomenon as almost every project is unique and difficult to duplicate. In the barge sector, several projects have been initiated to realise the transport of special products with dedicated barges (Wiegmans, 2005). For example, the Mercurial-Latistar barge from Wormerveer to Nijmegen transported wheat. This dedicated barge was only capable of transporting wheat (later remodelled into motor ship). Another example is a dedicated barge enabling transport of bananas from Antwerp to Duisburg under a constant temperature of 14°C. The main reason for the success of this type of projects lies in the advantages that can be realised by the participating company (cost decrease, transport reliability, sustainability).

Another opportunity might be to increase the use of vessels dedicated to river–sea transport (Konings and Ludema, 2000). Such a vessel reduces the number of transhipments necessary. The barge does not need to transfer in the coastal harbour, but can immediately proceed to its final inland destination. Konings and Ludema find that opportunities for this concept are limited due to draft restrictions. In addition to this combination also better connections between inland waterway and short sea transport might improve the Domestic Water Transport System.

AMSbarge, A self-unloading barge has been built and operated. The operation in the Port of Amsterdam stopped in 2009 and the vessel moved to Rotterdam. AMSbarge consists of four elements: New vessel; door-to-door concept; water-bounded pick-up and delivery points; and projectteam AMSbarge.

# Annex C: Defining Short Sea Shipping

There are a number of definitions of Short Sea Shipping (SSS) and no single definition is universally agreed on. The most often used classification criteria for SSS are based on: 1) geography; 2) type of loads; 3) type of traffic; and 4) legal (port of origin and destination). But there is no consensus among scientists on a definition because the SSS market is broad and diverse (Douet and Cappuchilli, 2011).

One broad and slightly adapted definition comes from Perakis and Denisis (2008): ‘SSS is a form of commercial waterborne transportation that does not transit an ocean and utilises coastal waterways to move commercial freight.’ The characteristic of a short sea vessel that has its origin and destination in Europe (not crossing an ocean) is important in order to set it apart from deep-sea shipping transportation.

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