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# **The maritime freight transport system in the UK: how and why is it changing?**

**Future of Mobility: Evidence Review**

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# The maritime freight transport system in the UK: how and why is it changing?

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# I. How is the maritime freight transport system changing?

While this evidence review is focused only on maritime freight transport, it is important to emphasise the **multimodal nature of most freight movements** – as freight flows across end-to-end supply chains it typically uses more than one mode of transport. Transshipment (moving from one carrier to another), transloading (removing product from one loading unit and placing it into another) and intermodal changes (loading units moving from one mode to another) are all quite common in the context of international freight movements. Because maritime freight transport exists not in isolation but within an interdependent and complex multimodal transport network, it is affected by developments in other modes of transport too.

Globally, maritime trade represents over 80% of total world merchandise trade, with UK ports handling some 5% by volume of total world maritime trade at some point in its journey (UNCTAD, 2016, p. 6; Department for Transport, 2017). Looking at the UK's maritime freight traffic in detail reveals some interesting trends (see also Appendix 1).<sup>1</sup>

Overall volumes are declining but imports are growing.

Overall **traffic volumes grew up until 2007 and then began to decline** and are now marginally less than they were over 20 years ago (501 m in 1994; 473 m in 2016),<sup>2</sup> reflecting a changing traffic profile and in part miniaturisation and lightening of freight. Liquid bulk (liquefied gas, oil, etc.) has been declining since 2000 and the share of imports has been increasing. Dry bulk (ores, coal, agricultural products, etc.) has been reasonably steady since 1994; as with liquid bulk the share of imports is increasing. Unitised (i.e. container (Lo-Lo<sup>3</sup>) and Roll-on/Roll-off (Ro-Ro<sup>4</sup>)) volumes have increased steadily over the time series – a slight dip post-2007 has reversed and volumes are now at the highest level since 1994. The share of imports has also increased slightly.

Other general cargo (containers less than 20 feet, forestry products, iron and steel products) – the smallest category of maritime freight traffic – is the only category where the share of imports has decreased slightly. Overall the share of imports across all types of maritime freight traffic combined has risen – in 1990 it was 57% and by 2015 had risen to 63%. Note that such 'directional imbalances' (with imports dominating) pose challenges then for the shipping lines that will have surplus available capacity typically on UK outbound legs (this is especially pronounced in the unitised trades). Both domestic traffic (i.e. movements within port areas and to offshore platforms, along the coast, and between ports in Northern Ireland and GB) and traffic along inland waterways (especially along the

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<sup>1</sup> Note that more detail on these trends is elucidated in the Foresight – Future of the Sea Evidence Review titled 'Trends in the Transport of Goods by Sea', UK Government Office for Science, 2017.

<sup>2</sup> Note that these figures refer to the UK's 53 'major ports' (those that handle more than 1 million tonnes annually); over 100 other 'minor ports' handle a further 11 million tonnes.

<sup>3</sup> Stands for 'lift-on/lift-off'. Containerised cargo that must be lifted on and off vessels and other vehicles using handling equipment.

<sup>4</sup> Ro-Ro cargo refers to wheeled vehicles that are either driven on to ships using their own power or on platform vehicles.

River Thames) also play a reasonably significant role in the context of overall maritime freight movements.

The above discussion reports historical and current trends – whereas the focus of this review is especially on the future and how the maritime freight system will evolve and change. To investigate this it is important to first note that maritime transport is a derived demand and thus depends on the desire of consignors and consignees to move freight. Traditionally, an easy way to estimate traffic patterns was via examining the link between trade and GDP link, but there is evidence (Appendix 2) that this link is not as strong as previously. Furthermore advances in technology and changes in the nature of user demand are both significantly altering the maritime freight system. The next two sections discuss both of these aspects. Due to the long investment horizons typical in the maritime freight sector (in particular for ports and ships due to their significant costs and long asset lives) it is essential to take a multi-decade future perspective.

## 2. How is the user engaging with the maritime freight transport system?

As noted above, many international maritime freight flows can involve **multiple modes and actors**. In the case, for example, of unitised maritime freight traffic – which typically carries higher-value freight – as well as the deep-sea shipping line, there will usually also be road haulage and/or rail companies responsible for transport at the start and end of the transport chain, plus freight forwarders and other agents that manage customs clearance, freight routing and so forth. In some cases too there may be an air–sea combination. The global maritime freight sector comprises a multiplicity of disparate actors.<sup>5</sup>

**Consolidation is an ongoing trend** among the shipping lines (an example was the collapse of the Korean shipping line Hanjin in 2016) given the highly competitive nature of the sector and the ever-present freight rates battles. After many decades without considerable change in how the maritime freight sector is structured there is some evidence now of emerging structural change. Some of the shipping lines see lost opportunity given the multiplicity of actors in the end-to-end transport chain and are looking to vertically integrate in order to capture more customer value.<sup>6</sup> **Non-traditional new players** are also emerging. Most notable among them perhaps are Amazon, who are renting space directly from the shipping lines and thus cutting freight forwarders out of the picture (Shead, 2017). **New routes are also beginning to emerge**, such as China's 'One Belt One Road' (comprising massive investment in connected transport infrastructure across 60+ countries, in essence seeking to revive the ancient Silk Road trading routes),<sup>7</sup> and the opening Arctic sea routes (UK Government Office for Science, 2017).

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<sup>5</sup> To get an insight into the sector, and to help unravel the roles played by the disparate actors, see for example Chapter 7 (Logistics Service Providers) in Mangan and Lalwani, 2016.

<sup>6</sup> One of the world's largest shipping companies, Maersk, for example are looking to integrate their various brands – see Porter, 2017.

<sup>7</sup> For further insights see for example McKinsey, 2016.

Within any supply chain there are three key flows, the obvious one being materials, but also two other key enabling flows: information and finance. The next section looks in more depth at digitalisation in the sector. One feature of financial flows is that the advent of Blockchain<sup>8</sup> may have a significant impact on how users engage around payment along the transport chain.

As noted in the previous section the trade–GDP link has weakened somewhat in recent years; however, it is possible to identify certain other trends that can aid an understanding of how user demand for maritime freight transport is shifting.

## Demographics and emerging markets

with world population set to increase to around 10.1 billion by 2100 (Dicken, 2015), and the population of the UK to grow to 70 million by 2027 (ONS, 2018), there should be continued demand for maritime freight transport. Increased urbanisation and the rise of megacities, combined with rising living standards in some developing countries, will lead to new trade patterns.

## Geopolitics and deglobalisation

While at present anti-globalisation rhetoric is ‘thick in the air’ (Economist, 2016) and there is a rise of ‘nationalism, protectionism, isolation’ (Grillo, 2017), the reality is that countries still need to trade with each other given their relative comparative advantages. The rise of geopolitical developments and trade agreements (e.g. Brexit, TTIP) will influence global supply chain designs and may also lead to new, niche trades.

## Changes in supply chain architecture

Maritime freight flows depend on the way supply chains are structured, as this dictates what products flow where. There is a growing awareness of **supply chain risk management** (e.g. from over-dependence on distant suppliers) and a concern that many supply chains are becoming too ‘stretched’, with the concomitant risks this entails (see, for example, Blanchard, 2015).

This may be serving as a ‘brake’ on supply chains becoming too stretched. Changes in manufacturing are also affecting supply chain designs. Production and trade patterns are shifting, with both **nearshoring and reshoring<sup>9</sup> increasing**. Additive manufacturing (3D and 4D printing) and related developments in materials science and decarbonisation, plus the growth of modular manufacturing (shipping semi-finished products rather than smaller parts and components), are also impacting supply chain structures. Views differ as to the relative impact of additive manufacturing on container shipping lines (Robertson, 2017) – a report by PWC concluded that as much as 37% of the ocean container business was at risk; in contrast DHL estimate that only 2–4% of their Asia–Europe container traffic is at

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<sup>8</sup> For an insight into Blockchain see for example Iansiti & Lakhani, 2017.

<sup>9</sup> Nearshoring refers to locating a business operation in a nearby country, usually bordering on the country where the core business is located; reshoring refers to moving previously offshored activities back to the home country.

risk. The nature of products that are shipped in containers is shifting to lighter products with a higher value/volume ratio and lower transport cost sensitivity. Value add to products in transit may also become more common in the future, e.g. 3D printing of products with ships acting as ‘rolling warehouses’ and ‘floating factories’. How all of these developments will play out for the UK and its maritime freight flows remains to be seen.

### 3. How is technology changing the maritime freight transport system?

Advances and applications in digital and other technologies are having an enormous impact on supply chain operations, especially with regard to enhanced connectivity and logistical efficiency; the ultimate aim is for supply chains to become ‘self-thinking’ with product flowing automatically to meet demand (see, for example, Calatayud, 2017). The maritime sector has been slow to adopt digital technologies, but it is quickly catching up with ‘**smart shipping**’ (i.e. networks of connected ships) – regarded as the next phase in the industry’s development (see Mangan, 2015). Applications are many include fuel optimisation and voyage management, weather routing, remote maintenance, cargo condition monitoring, crew welfare and management.

The sector has been slower than others, too, in embracing a green agenda, although again it is catching up (see, for example, Harvey, 2016). The focus of technological development is on **vessel design and propulsion with a view to reducing emissions and carbon footprint**. At the regulatory level efforts are underway to agree global carbon caps and trading mechanisms. Given the economies of scale that apply in shipping it is important to point out that both cost and carbon footprint per unit moved are generally lower than those for other modes.

It is likely that maximum vessel size will soon be reached due to the other system constraints such as port infrastructure. Currently the largest container ships are c.21,000TEU, and most commentators agree that the maximum foreseeable feasible ship size is c.25,000–28,000 TEU. Technological development in the sector has been incremental and – apart from individual technological developments such as the aforementioned Blockchain and smart shipping – major disruptive change (such as the way Spotify and iTunes revolutionised the music industry) is unlikely. Shipping is generally cheap, efficient and relatively safe and provides the means for countries to trade with each other – something they will always want to do regardless of any deglobalisation that takes place. (And deglobalisation will likely mean that alternative regional trading patterns would likely emerge.) In a post-Brexit UK new maritime freight flows will of course evolve to meet the country’s changed trading patterns.

#### Summary and Research Gaps

The Foresight review *Trends in the Transport of Goods by Sea* (UK Government Office for Science, 2017) envisioned that UK maritime freight flows in 2050 would be characterised by:

- A flexible (on and offshore) ports sector with automated handling capabilities and linked (physically and digitally) to its hinterland – serviced by a network of inland ports and intermodal transport connections; there will be increased use too of coastal shipping and inland waterways;
- Green and smart ‘future proof’ ships servicing a global shipping network characterised by inter-hub connections serviced by mega-ships, with more flexible smaller modular ships connecting these hubs to diffuse regional port networks;
- Product flows within self-thinking supply chains characterised by global flows of lighter and higher-energy products in a connected global economy, with ships acting as both rolling warehouses and floating factories with capacity to both process/customise products on board and react to both real-time and predicted demand.

There is already much ongoing research in the areas of shipping technology and smart shipping. What is perhaps missing – especially in the context of shipping as a derived demand – is research into how the **product portfolio of maritime flows in and out of the UK** is likely to change due to changes in markets, geopolitical developments, and changes in manufacturing, among other developments. Different types of products require different types of shipping capability (loading units, services) and thus it is important that the requisite network of services is in place to meet the UK’s future shipping needs. The UK has scored well on the World Bank’s Logistics Performance Index (LPI)<sup>10</sup> of 150+ countries since its inception in 2007 (currently ranked #8; previous rankings for the UK range from 4 to 10). As the maritime freight transport network is a key underlying component of this logistics capability, we need to ensure that this strong relative performance continues into the future.

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<sup>10</sup> The full index is available at:

<https://lpi.worldbank.org/international/scorecard/radar/128/C/GBR/2016#chartarea>



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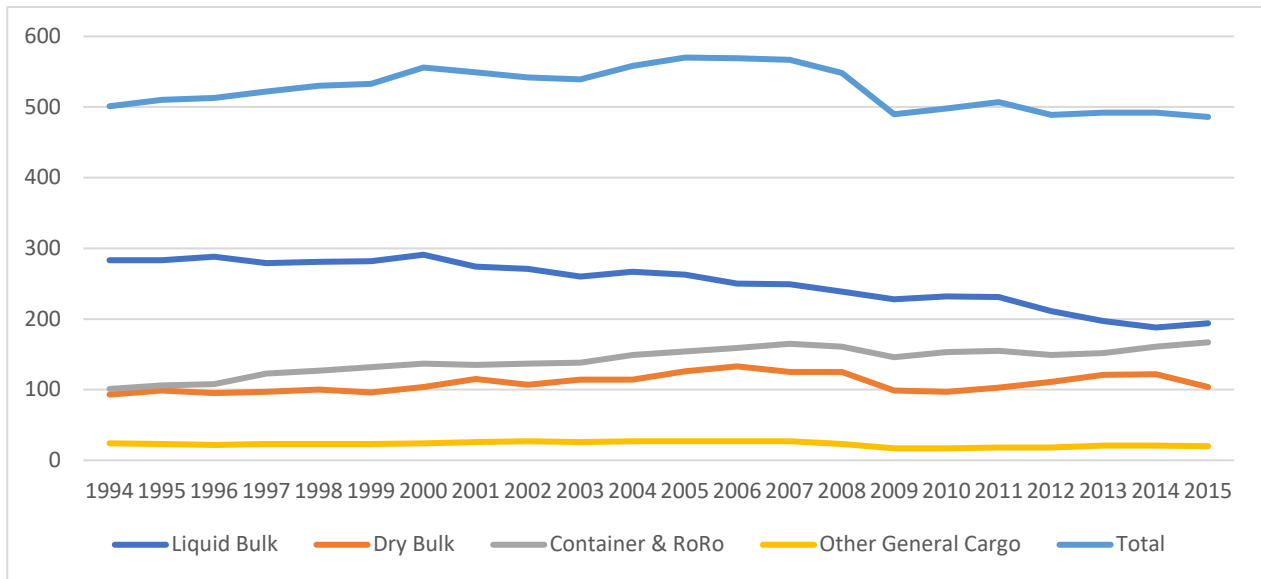
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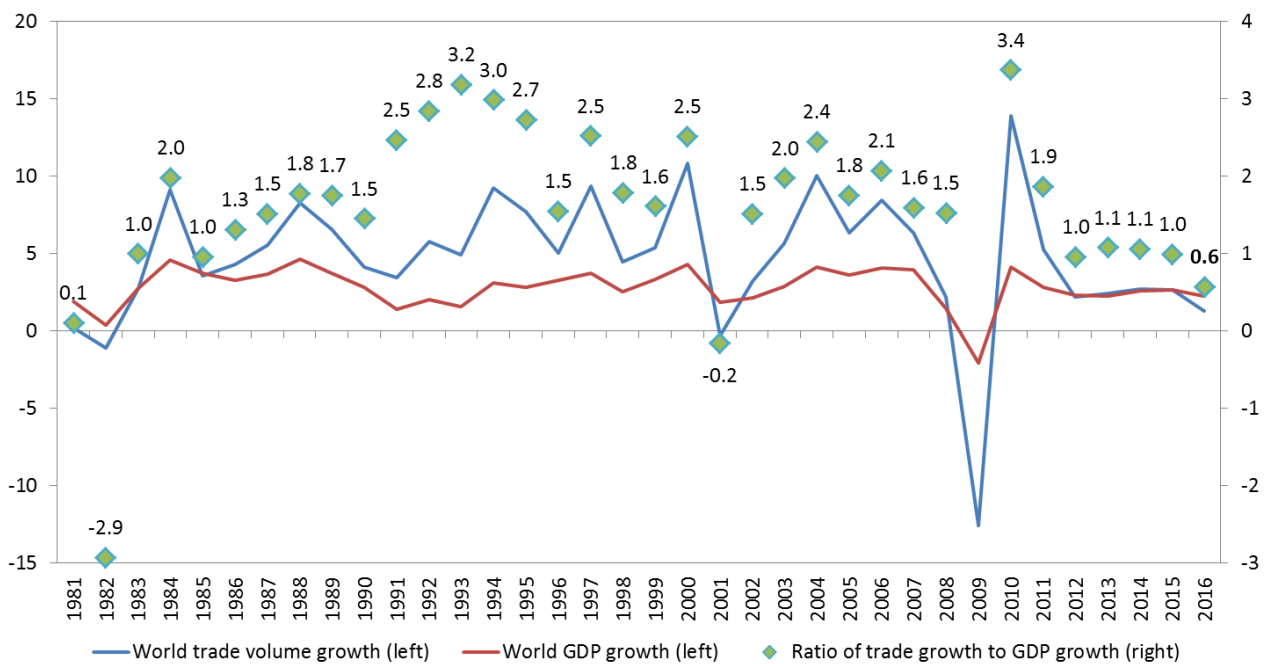
## 5. Appendices

### Appendix I: UK major port freight traffic (volumes in '000 tonnes)



Source: Department for Transport Statistics.

## Appendix 2: Ratio of world merchandise trade volume growth to world real GDP growth (1981–2016)



Source: WTO 12 April 2017 [https://www.wto.org/english/news\\_e/pres17\\_e/pr791\\_e.htm](https://www.wto.org/english/news_e/pres17_e/pr791_e.htm)

Note how the ratio has declined in recent years, and fell below 1.0 in 2016. For more on this topic see for example Mangan, 2017.



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