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Decarbonisation of Transport

Evidence from Cardiff Business School, Cardiff University

Decarbonising Freight Transport in Wales
Submission to Enterprise, Infrastructure and Skills Committee inquiry on Decarbonising Transport

by
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1. Introduction

Effective logistics is increasingly becoming an indispensable fundamental to the way we live our lives. We require reliable, cost-effective, responsive and sustainable logistics systems, within which freight transport is clearly a key component. Therefore, in aiming for a decarbonised Wales it is vital that freight requirements are considered and planned for on an integrated basis with all other aspects of the strategic framework.

It is recognised that freight transport, and logistics more widely, are among the most challenging of areas to decarbonise. This is also compounded by the facts that the economy steadily grows invariably pushing up demand for freight movement, and the way we live is highly dynamic, which changes the demands we place on logistics systems over a range of timescales. For instance, freight volumes globally are expected to triple between 2015 and 2050, according to projections published by the International Transport Forum, an inter-governmental think-tank, and during this period significant structural changes will occur around the nature of economic activity, such as the growth in e-Commerce. In the case of the Welsh logistics sector, it is expected that there will be a continued discernible decline in bulk commodity transport and an increasing requirement for inter-modal shipment and the use of light goods vehicles (LGVs), notably as supply chains become more time sensitive. This is all part of a broader shift towards lighter commodities, more frequent distribution cycles and lower average loads commensurate with a modern just-in-time economy, which is meaning there is a move in favour of road (rather than rail, for example) and towards the use of smaller vehicles, such as LGVs and vans. In addition, freight transport is a sector that is

predominantly privately owned and operated, so is outside the direct control of governments (unlike much of public transport for instance), which needs to be reflected in how the decarbonisation agenda is framed from a policy perspective.

Against this backdrop, in our review of the transport element of the draft report "Prosperity for All: A Low Carbon Wales", **we are concerned to observe that there is very little mention of freight transport in the proposed policy interventions**. This is surprising as freight is such an important part of transport. The emissions data for transport in Wales, assuming a business-as-usual scenario, suggests that **freight contributes between 30 and 40 percent of all transport emissions** (if light trucks, heavy trucks, buses, international shipping and domestic shipping together are added together, then the total comes to 40.4%. Some of that will be buses, and some of 'railway' will be freight. Hence the estimate of 30-40%). We would comment that the Wales Freight Strategy has not been updated since 2008, although we note that the Freight in Wales Report from the Freight Working Group was published in 2016 and the Marches and Mid-Wales Freight Strategy was subsequently published in 2018. Therefore, we would like to provide the Committee with some focused thoughts on how freight transport can contribute to the decarbonising agenda as highlighted below.

2. Logistics, not Freight Transport

We feel freight transport should be considered within the wider setting of logistics. The operation of distribution centres, warehouses and transport exchange nodes, such as ports and intermodal hubs, not only generate carbon emissions, but also have a considerable bearing on the operations and requirements for freight transport. We thus **advocate that the aim should be to decarbonise logistics, not just freight transport, in any strategies that are developed**. Such an aim should also include relevant logistics areas that can impact on the freight moved through transport networks, such as Information & Communication Technologies (ICT), and reverse logistics.

3. The Current Freight Strategy

The current strategy for freight transport in Wales is set out in the 2008 Freight Strategy Report, which was **built around a hierarchy of three principles that have been used to steer a future freight transport decarbonising strategy for Wales**. The principles are:

1. *"Minimise demands on the transport system through spatial policies such as encouraging local sourcing and influencing distribution policies;*
2. *More sustainable and healthy forms of travel, encouraging switches from road to rail and sea through the grant/taxation system, promoting interchanges and better freight information provision;*

3. *Make maximum use of infrastructure through best use policies for each of the transport modes*" (Wales Freight Strategy, May 2008)

Additionally, we note that these three principles do not cover the decarbonisation of logistics networks through efficiency gains, and fuel and vehicle improvements through innovation. We incorporate these elements in our discussion below.

4. Decarbonising of Freight Transport/Logistics around the Three Principles

Principle 1: Reducing the Demand for Freight Transport

There are a number of steps that can be taken to reduce the demand for freight transport, although it should be acknowledged that these decisions are often in the context of UK wide distribution networks and global supply chains. This adds complexity and often moves the point at which decisions are taken outside of Wales.

Ultimately, the most effective approach would be to reduce the amount of goods consumed and the length of supply chains that support this consumption. Returning to localised production and changing consumer behaviour would be ways to achieve this, although influencing such decisions is likely to occur through other areas of government policy-making, away from the area of transport.

It should also be noted that **transport planning can have a significant influence on the demand for freight transport generating trade-offs which are sometimes complex**. Much emphasis in the "Prosperity for All" draft strategy is placed on supporting sustainable travel options and reducing the need to travel. However, measures such as **emission zones around urban centres** may deter shopping trips, but in turn may increase the amount of freight transport required as products need to be delivered to more locations such as homes and offices. Equally, emission zones not suited to heavy goods vehicles may necessitate more frequent multiple deliveries using LGVs. It should also be noted that approaches such as introducing more **freight consolidation centres** could support an overall reduction in the demand / carbon emissions levels for/from freight transport. Interestingly, while often emphasised for urban areas, opportunities also exist for developing consolidation centres in more rural areas of Wales.

In addition, as freight transport is entirely a derived demand, we would highlight the fact that there are drivers increasing the need for freight transport, which works against this first Principle. For instance, the UK had the third largest e-commerce market in the world in 2016. E-commerce accounted for a 16.5 percent share of total business turnover in the United Kingdom in

2017. By 2021, around 93 percent of UK internet users are expected to make an online shopping purchase, the highest online shopping penetration rate in Europe. Couriers and logistics companies anxious to find economies of scale in their deliveries to end customers, which can make their operations more profitable, are investing heavily to ensure their operations match service expectations, as well as decarbonising their logistics networks. This is further fuelling the growth of this market, which in turn is meaning that the burden on the transport network will increase year on year as this market further matures.

Principle 2: More Sustainable forms of Transport

Encouraging less environmentally intrusive transport and travel behaviour could be achieved through switching towards more sustainable modes or by the introduction of traffic restrictions and revised taxation targeted at easing congestion at rush hours. This could require joint planning and operating of public and freight transport where the public and private sectors need to work more closely together. For example, this could lead to using spare capacity available in private and/or public passenger transport vehicles/journeys to, for instance, move parcels ordered through home delivery or click-and-collect distribution channels.

Principle 3: Making Best Use of Transport

Beyond this, there is the opportunity to ensure that the transport that does take place is done so as efficiently as possible. This may include choosing the most appropriate mode of transport, maximising the use of capacity, planning of logistics networks, efficient routing of vehicles, and the decarbonisation of vehicles and fuels themselves. Here there are more opportunities for transport policy to have an influence, and we consider below each freight transport mode in terms of practices to enable decarbonisation.

A. Road Transport

More freight vehicles on the road to satisfy customers' requirements will create extra burdens on other road users. This will increase the negative externalities of freight transportation in Wales, particularly in urban areas, if logistics providers do not invest in innovations to decarbonise both their networks and their fleets. Despite the increasing importance of smarter transportation on the political agenda, very little empirical information is available in the Wales context.

Integrating passenger and freight flows where possible can be a promising solution to the needs of modern world because the same transportation needs can be met with fewer resources (i.e., road vehicles). A successful integration

can make socially desirable transport options economically viable in rural areas where the population is declining. In urban areas, it can help reducing traffic congestion and emissions (i.e., greenhouse gases and air pollution) and facilitate the development of hybrid, electric and autonomous vehicles. Besides, further research should be undertaken on alternative greener fuel sources, such as second generation of biofuels and nearly zero carbon renewable energy sources, such as wind, biomass and solar, that could be used to electrify road transport. One pertinent question on electric vehicle technology that needs to be addressed is the environmental footprint of batteries, which is a significant shortfall of this type of technology.

Other positive actions that could be considered in reducing carbon emissions from road freight include:

- Enhancing driving standards and styles
- Increased use of routing software and telematics
- Implementation of Euro Engine Standards
- And perhaps more radical ideas such as
    - Using buses instead of trucks for low volume movements
    - Use of hybrid passenger/freight vehicles
    - Use of sensors, smart traffic lights, congestion zones, AI for advanced traffic routing etc.

In addition, positive actions around the use of alternative fuels may be incorporated in to the strategy with issues to be considered including:

- Where are we with these technologies with particular reference to Wales?
- Infrastructure requirements for bio-diesel fuel, electric vehicles and bicycles
- Biofuels versus renewable energy debate
- Suitability of different energy sources based on locality and weather
- Storage of organic waste as a resource for the generation of biomass energy that can be used to electrify vehicles and warehouses

The introduction of autonomous vehicles for the transportation of goods represents a major step forward environmentally, socially and economically. Autonomous vehicles reduce emissions and air pollutants, protecting the environment and improving people's lives. Socially, these vehicles support the sharing economy and contribute to advancing the sustainable development agenda. Finally, autonomous vehicles also improve the planning of transportation activities, making road transportation more efficient and economical. However, the Welsh road network was designed for independent drivers and there are many financial, technical and legislative challenges to overcome before driverless vehicles will be a reality.

An extension of automated vehicles is the truck platooning concept – consideration of what this could offer and how it could be implemented should be part of future thinking.

The future of transport can be envisaged as being "seamless mobility" where all modes and vehicles are fully connected and integrated into a single network of information exchange. As mentioned, one possible implementation of (semi-)autonomous vehicles is the truck platooning - the linking of two or more trucks together to create a train, enabled by the Internet of Things (IoT) and automated driving support systems. Truck platoons (with wider consideration of passenger transport applications and implications) are effectively "road trains"; instead of railway tracks and signals. These 'trains' are connected through an advanced communication and sensor network.

The practice of truck platooning will grow dramatically over the next decade, but governmental and business participation is still limited, and the effectiveness of the system remains unexplored. European Union countries are leading the efforts of achieving truck platooning in the near future, with trials ongoing, particularly in the Netherlands. By 2025, truck platooning will be a regular phenomenon on European motorways. So why is the UK not preparing for this technology?

Compared to other European countries, the United Kingdom has been slow to react to this technology. Despite the UK government's ambition to see fully self-driving vehicles, without a human operator, on the road by 2021, limited progress has been achieved so far. **The UK government and, where devolved, The Welsh Assembly needs to provide a clear agenda,** beginning with trials following fixed routes in dedicated lanes to fully automated, multi-vehicles platoons in real-life traffic environment. The current UK road network is an obvious challenge, but a challenge that could definitely be overcome through investment in technology. Wales can be a part of this technological transformation and take advantage of all the potential benefits.

B. Rail Transport

Points to consider here could include:

- Modal shift from road, which is more challenging as a large amount of freight moves relatively short distances to/from and within Wales
- Limited capability and applicability of alternative fuels for rail.
- A UK wide rolling programme would help as it would reduce costs and enable some 'freight friendly' infill sections. E.g. once GWML electrification is complete, the Cardiff to Felixstowe container train will cover probably 80% under electric, but be diesel hauled because of a small amount of track in London and the Felixstowe branch line are not electrified.
- However, many freight routes are unlikely to ever justify electrification and therefore diesel haulage will remain.
- Therefore, should we be looking to take this freight off the railways once electric HGVs are established?

- To overcome the passenger vs freight arguments where capacity constraints exist. There is a need to think about this now because of the longevity of railway assets.
- A key aspect that should also be researched is the location of intermodal terminals (with or without customs clearance) in Wales that could facilitate intermodal connectivity between sea and rail transport flows at Welsh sea ports, and rail and road transport flows centrally located in Wales.

C. Shipping and Seaports

Issues in shipping include:

- Carbon is not the only problem with shipping, given the fuel type used. Wider issues of air quality need to be considered
- What alternative fuels are there?
    - Considerable research here around hybrid engines is being carried out but progress is relatively slow
- Emissions from ports should also be considered – e.g. ABP has an electricity farm at Barry.
- Surface based modes for international trade are becoming more important (e.g. the landbridge transport to/from China)
- The decentralisation of container handling from England to Welsh ports should also be on the agenda of the Welsh Government. Such an initiative could reduce the tonne-km of the UK road freight transport sector as whole.

D. Aviation and Airports

In air freight the following could be considered:

- Very limited freight is transported directly from Cardiff Airport and generally goes in the hold of passenger aircraft. Therefore, improving emissions in passenger transport should have a benefit for freight.
- More generally, a need to challenge the demand for intercontinental freight by air could be made with rail landbridge routes now becoming viable alternatives.

E. Pipeline

Although a specialist area this is also an important mode of transport. Areas of consideration include:

- An acknowledgement that a significant amount of oil and LNG moves by pipeline, which is probably the most carbon efficient mode currently (albeit for carbon unfriendly products).

- Are there more opportunities for this mode? It would be difficult to justify the Welsh Government providing the infrastructure, but support for any planned developments could be considered.
- Much is made of capsule pipelines and underground freight (such as Hyperloop) for future freight movements but, beyond new urban developments, the infrastructure cost is likely to outweigh the benefits. Also, this technology remains under development.

Finally, in this discussion on freight modes, we believe the traditional segmentation of considering passenger and freight transport as completely separate entities could be challenged, as there will be increasing opportunities for these two networks to operate synergistically together with an improved sustainability outcome.

5. Conclusions

In summary, we consider that the Welsh Government's vision for the decarbonisation of transport is not sufficiently innovative, particularly in the area of freight transport (and logistics!) where new technologies and imaginative solutions could contribute to meeting the decarbonisation objectives being proposed.