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The route to NET ZERO 2050 for logistics

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Julian Worth and Richard Wilding assess why a holistic intermodal solution offers a promising way of reducing carbon across the supply chain.

The path is set: as a country, we need to achieve net zero by 2050. Net zero means gaining a balance between emissions produced and emissions taken out of the atmosphere. In one sense, 2050 seems a long way off, but it is well within the working life of a manager in his or her 30s, let alone someone who has just joined the sector fairly recently. To achieve this goal, the current processes, organisation, information systems and infrastructure of supply chains will have to be radically altered. Given that there will be major infrastructure implications and that the UK is, at times, slow in building new infrastructure, as professionals we need to plan now.

It is not uncommon for largescale infrastructure projects to take tens of years to execute – for example, the HS2 project was formally initiated in January 2009 with a current, arguably optimistic prediction of completion in 2033, a project of 25+ years. It can be argued that as supply chain professionals we need to start evaluating what infrastructure needs are required now in the early 2020s to accommodate the requirements for net zero in 2050.

Initial high-level consideration of decarbonising various sectors of the economy is already suggesting that agriculture and aviation are likely to prove very challenging. The aviation industry is actively pursuing biofuels to blend with conventional jet fuel and reduce the amount of carbon generated, but full decarbonisation of long-haul flights is likely to be elusive. It is already being suggested that, for the country to achieve net zero, most – if not all – other sectors will probably need to get to gross zero – that is, reducing all source emissions to zero.

This is a stark message indeed for the logistics sector. Dependent as we are on diesel fuel for the overwhelming majority of our activities, what on earth are we going to do?

First, the good news. With best-in-class warehouse technology and battery power for all material-handling equipment and yard shunters, we can probably eliminate carbon from distribution centres. In addition, the prognosis for short-range light trucks looks broadly positive, and given the necessary supply of electricity and charging infrastructure, urban deliveries should be capable of decarbonisation.

^ Decarbonising activities that rely on big diesel engines will be a huge challenge

The serious problems start with activities that rely on big diesel engines, be they HGVs, diesel locomotives or large commercial ships, especially those engaged on transoceanic voyages. Massive effort is going into producing better batteries and viable hydrogen propulsion systems, but, as things stand, the latter require huge amounts of energy to produce the fuel, at a time when the general objective is to make ourselves more energy efficient.

New technologies such as drones and 3D printing have a role, but currently it is barely conceivable that they have much to contribute to mainstream volume logistics. 3D printing could be very valuable in producing relatively small, high-value components at the point of consumption, thereby reducing down time in the event of a critical component failing. It could also result in micro factories based locally to consumers, thus reducing the need for long transport of finished products.

Drones can be extremely useful in delivering packages to remote areas, thereby avoiding a lot of 'man-in-van' miles, and are already invaluable in observation and imaging. However, the notion of drones making more than a small proportion of deliveries in urban areas, to high-rise buildings, avoiding power lines – and each other – stretches credibility to breaking point. As someone suggested recently, a drone version of Hitchcock's *The Birds* is not too hard to visualise.

For mainstream volume logistics, electric power currently looks to be the most likely – perhaps the only – solution to decarbonisation. Battery technology is improving rapidly and viable cars/vans are already with us. Light trucks are under trial in continental cities on a variety of delivery cycles and an experimental artic carrying light loads over a short distance is in use on an inter-plant shuttle in Germany. The pressure for dedicated urban vehicles, with good all-round visibility and

V Efforts are being made to ensure last mile delivery is more environmentally friendly

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cyclist/pedestrian protection, is consistent with short-range operation and it is entirely conceivable that this model will flourish in the decades to come. This, however, is a world away from long-distance trunking with 44t HGVs, for which the number and size of current batteries required would account for most of the 26/27t payload.

Similar challenges of mass and space on an even greater scale apply with freight trains and ships. A combination of wind and solar power might perhaps offer a way forward for ocean-going ships, particularly if these energy sources can be harnessed to charge battery banks and/or produce hydrogen for use when climatic conditions are not favourable for primary propulsion. Conceivably, an extended role for super-tugs taking ocean-going vessels out into main shipping lanes, and collecting them therefrom, could avoid using engines of the main vessel for energy-intensive manoeuvring into and out of port and conserve power for the long haul.

The super-tugs could be recharged from shore supplies and, as non-cargo carrying vessels, could be loaded with substantial battery banks. A similar concept, akin to barges hauled by tugs, might offer potential for short-sea routes – for example, across the English Channel, the Irish Sea and the North Sea. The inherently low resistance of water, in the absence of tides and currents, does at least make waterborne freight an easier prospect than land-based modes.

Which brings us neatly to the biggest challenge: how do we move full loads over medium and long distances using electricity? Railways have proven systems for electrification and, after the aberration of Great Western electrification – when industry skills had to be painfully and expensively relearned – the costs of electrification are now returning to much more reasonable levels. There is still some way to go to match the costs achieved in Germany and elsewhere, but, from a peak of £2.6 million per track-km, latest installations are coming in at around, or below £1 million per km.

Much of Britain's trunk rail network is already electrified and it has been calculated that around 320 miles, of mostly extensions and infills, would allow approaching three-quarters of UK rail freight to be electrically hauled. Electrifying a further 150 miles or so would probably lift this proportion close to 90%. The current fleet of diesel locomotives will start to reach life expiry around 2030 and a replacement electric fleet, equipped with battery last mile capability for working in terminals and along short branch lines, would take advantage of the growing electrified mileage.

We therefore have a proven technology for electrically powered trunk haulage by rail and, very probably, a capability for electrically powered local distribution by road. An intermodal solution would thus seem to offer a promising way forward.

However, a further challenge is creating net zero in our electricity supply. An interesting freely available app called Grid Carbon shows that the carbon intensity of the UK grid can easily approach 300g $C0_2$ per kWh so further infrastructure investment will be needed in this area. Even an efficient electric car that does four miles per kWh of charge is still creating 75g CO_2 per mile unless charged from wind, solar, hydro or nuclear. Therefore as a society we are going to face significant challenges in achieving net zero.

From a supply chain perspective and despite the challenges, a holistic intermodal solution would thus seem to offer a promising way of reducing carbon.

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