What level of ambition is achievable and worthwhile for rail freight?

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Summary, recommendations and conclusions

This report attempts to set out, using the available literature, an ambitious growth scenario for railfreight and the likely economic, social and environmental benefits from pursuing such a scenario. It finds that such a scenario is achievable in principle and would bring a range of benefits including reduced congestion, increased employment, reduced carbon emissions and improved air quality and road safety. To achieve these benefits would require different public funding and policy frameworks to those now in place: higher levels of capital investment and revenue support and other complementary policies supporting an increase in freight transport by rail and in rail's share of total freight transport. Such an approach would encourage further significant private investment in railfreight services and terminals.

Bringing together the evidence gathered from the literature shows clearly the interventions that would contribute to achieving this ambitious railfreight scenario. Research by Arup[1] confirms that the most effective measures in terms of impacts on road and rail freight are investment in rail infrastructure (a strategic freight network, plus capacity and gauge enhancements), increased grants, and "cross government policy intervention", representing supporting measures such as reintroducing the road fuel duty escalator. Research for Transport for the North[2] and others identifies rail freight interchanges and linking freight sites to the rail network as important determinants, especially if complemented by restrictions on diesel vehicles in cities. New forms of rail freight services, including express parcels on passenger trains, could also contribute to achieving the ambitious growth scenario.

This leads to a series of conclusions and recommendations:

- **Invest in a strategic rail freight network**: increased capacity and gauge enhancements across the rail network to release suppressed demand for railfreight. Plans for this investment have been drawn up by Network Rail and the freight operating companies[3]
- **Electrify railfreight**: in addition to the investment in capacity and gauge enhancement, invest in a sustained rolling programme of infill electrification over 10 years to create a strategic electric freight network covering 60% of railfreight services[4]
- **Promote and where appropriate invest in linking freight sites to the rail network**, including a network of multi-modal distribution parks. Alongside this, amend national planning policy to actively support railfreight, for example by requiring freight generators like warehouses to be located at rail-connected sites
- **Invest in new types of railfreight services** including high gauge swap body freight, city centre freight services to stations[5] and consolidation hubs, and freight on passenger trains,

[1] https://www.arup.com/-/media/arup/files/publications/f/future_potential_for_modal_shift_in_the_uk_rail_freight_market.pdf
[2] https://www.transportforthenorth.com/wp-content/uploads/TfN-Freight-and-Logistics-Report.pdf
[3] https://cdn.networkrail.co.uk/wp-content/uploads/2018/02/FNPO-Route-Strategic-Plan.pdf
[4] http://www.freightonrail.org.uk/PDF/Modern-Railways-April-2018.pdf
[5] https://www.railwaygazette.com/news/freight/single-view/view/colas-rail-and-tnt-tests-express-rail-logistics.html; http://www.ajhplant.com/freight-trials-continue-at-euston

especially high value lower volume freight like parcels and fresh produce. These could link with restrictions on diesel trucks and vans in cities, already being planned by many cities as part of Clean Air Zones

- **Increase grants for railfreight and/or reduce access charges** (as Germany has recently done). There are already limited grants available to support railfreight flows, and grants to support investment in railfreight facilities could be reintroduced.

Mainstreaming railfreight in transport and industrial policy: alongside these specific measures, an ambitious scenario for railfreight requires more general Government support, through making railfreight part of the mainstream of transport policy and industrial strategy. However the railways are organised and structured, an ambitious policy for increasing railfreight requires freight services to have access to the tracks at a cost and performance that allows railfreight to remain competitive with road freight, and railfreight needs to be fully considered and included in the structures, strategies and investments in the rail industry. Investment in railfreight, especially in the Strategic Rail Freight Network, should be considered as part of overall infrastructure spending. Research (some of it sponsored by the Government) has clearly shown that increasing the use of railfreight could on some corridors be a very effective measure in tackling road congestion, so investment in railfreight can and should be considered as an alternative to road-only options for tackling congestion on some major road corridors. This ambitious scenario would therefore require a more multi-modal approach to transport infrastructure spending and management, especially on interurban transport, than has been the case in recent years.

It is also important that railfreight is considered in the Government's wider industrial strategy, including in all regulation, planning and taxation measures applying to the freight and logistics sector but also in policy for other sectors of the economy such as ports, automotive, energy and construction. Research by Transport for the North and others suggests that this can bring large economic and industrial benefits. Freight is a largely private sector, privately run business – such Government support can result in significant private investment in freight terminals, and railfreight trains and services.

Road pricing for lorries: the benefits of the investment in and support for railfreight for this ambitious scenario will be enhanced if accompanied by distance-based road pricing for HGVs. HGVs in the UK are already subject to a time-based levy, and the Government has discussed the option of moving towards a distance-based charge[6]. Many other countries already have such a charge and moving in this direction could result in a further significant increase in railfreight, especially if the charge were designed to recoup the full costs HGVs impose on society, with extra charges rather than being revenue neutral. Because distance-based road user charging would target longer distance road flows, this would support rail's natural advantage on those flows, with road haulage catering for more local transport. Of course, road user charging for HGVs could raise significant revenue - £6.7bn if external costs are charged (2007 prices)[7].

The study has shown that there are benefits from an increased railfreight strategy in terms of reduced congestion and environmental impacts, (including faster decarbonisation of the freight sector), improved road safety and better road maintenance; there are also broader economic and

[6] https://www.gov.uk/government/consultations/reforming-the-heavy-goods-vehicle-road-user-levy
[7] https://bettertransport.org.uk/sites/default/files/research-files/road_pricing_freight.pdf

employment benefits. The Arup report suggests that the combination of all these measures could save 40% of the annual CO2 emissions from HGVs.

The table below shows the different interventions and their likely cost in terms of public funding, likely impacts on railfreight and the wider benefits. It also includes a multiplier of 50% to represent impacts of road pricing or similar measures. Clearly these numbers are indicative rather than precise – but they are a reasonable guide to the likely costs and benefits of packages of investment and interventions to support railfreight. An additional table setting out detailed calculations is attached as an Appendix to this report.

Policy Intervention	**Amount of public funding**	**Impact on railfreight**	**Wider economic, social and environmental benefits**	**Total benefits if enhanced with HGV road pricing multiplier[8] or equivalent (50%)**
Fund current plans for strategic investment in rail freight capacity	£0.6-1.1bn CP6; £2.9bn-6bn CP7[9]	Unlocks higher growth in railfreight; up to 49% growth in tonnes lifted 2016/7-2023/4, 60% growth by 2043 (railfreight currently 9% mode share[10] so this means growth to 13.5%)	[£89m per year]; Monetary benefit: £1.7-4.7bn overall over 7 years.[11] Non-monetary benefit: 15.01bn tonne km per year reduced road freight by 2030 (=10.2 % of current road freight) and carbon reduction 0.42mt CO2e/year[12]	£2.5-7.0bn over 7 years, plus increased environmental benefits of £0.4bn

[8] Multiplier derived from Transport 2000/MDS (2007) study, which, using the same model as used by the DfT, indicates that a distance-based HGV levy set at a level to cover the full external costs of HGVs would result in approximately 50% uplift in rail freight volumes above business as usual. See main text p8 https://bettertransport.org.uk/sites/default/files/research-files/road_pricing_freight.pdf

[9] Ranges represent uncertainties in scheme delivery costs, not differences in number of schemes or specifications. It is unclear what proportion of this funding is currently included in Government spending plans. Enhancements were excluded from the Statement of Funds Available for 2019-24 Control Period 6, leaving them to be funded as and when DfT and Treasury see fit. Funding is completely uncertain for 2024-29 Control Period 7. For the purposes of this analysis, we assume Network Rail and partners have capacity to deliver the enhancements they have identified as part of their strategy.

[10] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/787488/tsgb-2018-report-summaries.pdf; https://www.gov.uk/government/statistical-data-sets/tsgb04-freight#domestic-freight-transport, table TSGB 0403

[11] https://cdn.networkrail.co.uk/wp-content/uploads/2018/02/FNPO-Route-Strategic-Plan.pdf These WebTAG assumptions incorporate reduced congestion and various environmental benefits, similar to the valuations used for Mode Shift Revenue Grants.

[12] Arup estimate reduced road freight of 6.31bn tonne km and a reduction in carbon of 0.48 mt carbon/year (0.18mt CO2e/year) by 2030 (on a 2016 baseline) from an investment in the Strategic Freight Network and 8.70bn tonne km and 0.66mt carbon/year (0.24 mt CO2e) from investment in capacity and gauge

Policy Intervention	Amount of public funding	Impact on railfreight	Wider economic, social and environmental benefits	Total benefits if enhanced with HGV road pricing multiplier[8] or equivalent (50%)
Commit to a sustained rolling programme of infill electrification to create a strategic electric freight network	£1bn spend - £100m per year for 10 years[13]	Reduced operating costs and increased capacity	Non-monetary benefits: 349,000 tonnes less CO2 per year (0.35 mt CO2) at 50% electric railfreight[14]. Enables decarbonisation of rail and wider freight industry	N/A
Link freight sites to the rail network and other measures [15]	£2.9bn TfN [16]package 2018-33 (national spend pro-rata £6.7bn)[17]	32.7m extra railfreight train km/year (72% extra) and 56m extra railfreight tonnes/year (56% extra) 2018-2033 compared with business as usual (= 42% increase on 2014 railfreight tonnes)	Monetary benefits: £13-20bn economic benefits[18] (£30-47bn nationally), 25000-38000 jobs (58000-88000 nationally), plus £34bn user and environmental benefits (£79bn nationally), carbon reduction estimate 1.5 mt CO2e/year[19]	£19-30bn economic benefits, £51bn user/ environmental benefits

enhancements https://www.arup.com/-/media/arup/files/publications/f/future_potential_for_modal_shift_in_the_uk_rail_freight_market.pdf

[13] Note this is additional to the strategic investment in railfreight capacity and could in many cases be shared with passenger service electrification

[14] Arup ibid

[15] This is based on the freight and logistics research for Transport for the North, which modelled a series of Multi-Modal Distribution Parks and other land use planning and investment.https://www.transportforthenorth.com/wp-content/uploads/TfN-Freight-and-Logistics-Report.pdf

[16] TfN = Transport for the North

[17] https://www.raildeliverygroup.com/files/Publications/2018-06_rail_freight_working_for_britain.pdf. This takes KPMG figures showing that regions in the North of England together account for 43% of the total economic benefits from railfreight. This gives a multiplier for national benefits and has been used as an indicator for costs as well.

[18] From TfN study reference 13

[19] This is using carbon savings estimates from https://www.arup.com/-/media/arup/files/publications/f/future_potential_for_modal_shift_in_the_uk_rail_freight_market.pdf, table 7.5, for new and refurbished terminals, land safeguarding and consolidation centres. Note that these are by 2030 on a 2016 baseline, whereas the TfN measures are calculated for 2018-33.

Policy Intervention	Amount of public funding	Impact on railfreight	Wider economic, social and environmental benefits	Total benefits if enhanced with HGV road pricing multiplier[8] or equivalent (50%)
Support new types of rail freight services	Unclear, but could be included passenger rail service specifications and NR programmes	Up to £138m of extra revenue (15% addition to current freight operating companies' turnover)[20]	Reductions in vehicle numbers on road and opportunities for sustainable first/last mile	£207m extra revenue
Increase railfreight grants and/or reduce access charges	Increased grants budget to £50m/year	Increased use of railfreight (4.64bn tonne km per year, +27%), reduced road freight (4.91bn tonne km per year, -3.4%) 2016-2030[21]	Reduction of 378,624 tonnes of carbon per year by 2030, = 1.4mt CO2e	
TOTAL over 7 years (capital) (revenue)	£6.28-8.8bn £350m	Up to 49% increased rail freight tonnage Est 12.6% tonne-km	£52.6-63.5bn	£78.9- 95.3bn
TOTAL over 10 years (capital) (revenue)	£8.97-12.57 £500m	Up to 79% increased tonnage[22] Est 18% increased tonne-kms	£75.1-90.7bn[23]	£112.64-136.1bn

[20] "Carriage of Goods on Passenger Trains", Arups for Department for Transport, 2016
[21] Figures from https://www.arup.com/-/media/arup/files/publications/f/future_potential_for_modal_shift_in_the_uk_rail_freight_market.pdf
[22] Calculations based on pro-rata increase in railfreight tonnage carried, with capacity increases and linking freight sites to the rail network, over the 7 and 10 years respectively.
[23] Calculations based on pro-rata benefits in increases in capacity and economic, user and environmental benefits from linking freight sites to the rail network, over 7 and 10 years respectively

Introduction

Most discussion on rail freight is within current funding and policy frameworks. This report looks at the potential outcomes with different frameworks: higher levels of capital investment and revenue support and other complementary policies supporting an increase in freight transport by rail and in rail's share of total freight transport. The aim is to look at the wider economic, social and environmental benefits from a new approach.

Current trends and investment in rail freight

Unlike in North America, freight on rail in Britain operates as a marginal user within a predominantly passenger railway. The companies operating freight trains are mostly privately run and bid for access rights on the rail network. Freight on the railways is now run in dedicated freight trains; previous services carrying freight on passenger trains (latterly Red Star Parcels) ceased in the 1990s (though small niche services have restarted recently). Alongside public funding for infrastructure, there has been significant private sector investment in railfreight – the freight operators have invested over £2bn since 1997[24] with additional investment by those constructing and running wagons and terminals.

Freight on the railways has been through a period of huge change. Broad trends include:

- A decline in coal traffic to power stations, traditionally a staple traffic of rail
- An increase in intermodal traffic, especially to/from the ports but also serving inland strategic rail freight interchanges. 25% of all containers inspected or exported travel by rail, rising to 30-40% at the deep-sea ports of Felixstowe, London Gateway and Southampton
- An increase in construction traffic, especially aggregates (110% since 1997).

Railfreight volumes in 2017-18 were around 17bn tonne-kilometres, accounting for around 9% of total surface freight movement. This has fluctuated – it was 8% in 1998, rising to 13% in 2014, but has fallen with increases in road freight and decline in coal and steel bulk traffic. Compared solely to heavy goods vehicles (HGVs), rail's share was 16% in 2016[25].

The rail industry's long-term planning process, led by Network Rail, has produced forecasts of future railfreight traffic based on these trends. These have a range of scenarios – the 2013 Freight Market Study by Network Rail forecast an increase of tonne kms to nearly 60bn by 2043[26].

However, various factors have combined to see lower growth since the 2013 study. These include a continued freeze on fuel duty and lower wage growth which have helped road freight to keep its costs lower than predicted. There has also been less rail-based warehousing completed and there are continued capacity constraints on the rail network. The latest Network Rail strategic plan for freight (February 2018) therefore has a range of shorter-term scenarios, suggesting that freight moved (tonnes lifted) could increase from 2016/17 to 2023/24 by between 18 and 49%, depending on whether policies and market factors favour rail or road, and on general market growth. These scenarios all assume unconstrained network capacity; two further scenarios which include

[24] https://www.raildeliverygroup.com/about-us/publications.html?task=file.download&id=288 quoting KPMG for ORR 2013

[25] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/552492/rail-freight-strategy.pdf para 46.

[26] https://www.networkrail.co.uk/wp-content/uploads/2016/11/Freight-Market-Study.pdf, figure 4.18

constrained network capacity predict a reduction in railfreight tonnage of 9% or an increase of only 13%. For planning purposes, Network Rail is assuming 15.6% growth for this period[27].

These scenarios show that trends in railfreight traffic are at least partly dependent on available capacity on the rail network to accommodate growth. They are also dependent on the availability of freight terminals or railheads to allow freight users convenient access to the rail network, as well as wider policies and market factors and whether these give advantages to rail or road for freight.

Other studies have supported this analysis. A 2016 study by Arups for the Department for Transport concluded that "there is clear potential for growth across several commodity groups. However, much of this is currently forecast to occur on the road network rather than on the rail network. Therefore there is an opportunity to initiate modal shift away from road and towards rail to accommodate this growth, as well as move existing traffic from road to rail. However, these opportunities may not be realised due to barriers which currently inhibit this modal shift."[28]

This analysis has been used by the industry to develop a programme of public investment for the current and future control periods in the "strategic freight network", based on releasing suppressed demand through targeted investment at pinch points on the rail network. The 2017 Freight Network Study analysed 11 strategic corridors and produced a set of investment proposals in these, covering capacity (extra lines, signalling etc), gauge (allowing higher trains to take taller containers) and capability (longer and heavier) trains[29]. In the longer term, line reopenings are also suggested to provide more direct routes for freight with more capacity. This investment is set out in the 2018 strategic plan as a 15-year programme. The cost of schemes to be delivered in the 2019-2024 Control Period 6, is estimated at £600m-£1.1bn. A further set of schemes, to be developed in CP6 but delivered in CP7, is estimated at between £2.9bn and £6bn, and there is a list of possible projects for CP8 which are not costed at present. However, as the strategy notes, this is not currently committed[30]. The Government has yet to determine its spending on rail enhancements in CP6, because it is promoting these enhancements as a pipeline of schemes, to be funded as they come forward, rather than, as in previous control periods, as a 5-year programme[31].

It should be noted that this applies to England and Wales. The Scottish Government has a separate regulatory settlement for the railways and in its High-Level Output Specification for CP6 it has set a target of 7.5% growth in railfreight in Scotland 2019-24, and is funding investment in gauge and capability enhancement accordingly[32]. This has been followed up by a "growth plan" from the industry which shows how this target will be developed, planned and delivered[33], including infrastructure spending during CP6.

Beyond the investment in the strategic freight network, there is at present very limited direct public funding for railfreight services. There is a small grants scheme– the Mode Shift Revenue Support

[27] https://cdn.networkrail.co.uk/wp-content/uploads/2018/02/FNPO-Route-Strategic-Plan.pdf
[28] https://www.arup.com/perspectives/publications/research/section/future-potential-for-modal-shift-in-the-uk-rail-freight-market
[29] https://cdn.networkrail.co.uk/wp-content/uploads/2017/04/Freight-Network-Study-April-2017.pdf
[30] https://cdn.networkrail.co.uk/wp-content/uploads/2018/02/FNPO-Route-Strategic-Plan.pdf Appendix C
[31] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/691719/rail-network-enhancements-pipeline.pdf
[32] https://www.transport.gov.scot/publication/the-scottish-ministers-high-level-output-specification-for-control-period-6
[33] https://cdn.networkrail.co.uk/wp-content/uploads/2019/03/Scotland-Industry-Growth-Plan-for-Rail-Freight.pdf

scheme[34] - which supports some rail freight flows. No other public funding for rail freight now exists in England; a Freight Facilities Grant scheme, funding the capital costs of rail freight facilities, was scrapped in England in 2011 but has been continued by the Scottish and Welsh Governments.

There is also what could be described as indirect public support for rail freight. As marginal users, freight trains pay only their marginal costs for use of railway tracks, and there is also a long standing "red diesel" scheme which means that diesel freight (and passenger) trains pay lower fuel duty than other diesel users (farmers and other industries also benefit from this scheme)[35].

In summary, there is investment in railfreight, though the current enhancements framework makes this difficult to quantify. The industry has proposed a programme of schemes to release capacity and enable growth over the next 15 years or so. This would support increased railfreight by overcoming network capacity constraints. Based on the industry modelling work, this might allow railfreight to increase by up to 49% by 2024 in terms of tonnes lifted (based on the 2018 scenarios) and by up to 50% in tonne kilometres over the same period (following the 2013 forecasts)[36].

Increased ambition

The scenarios and investment proposals described above are based on the railfreight industry's current operating environment and the current broader policy environment. This report is however looking at options for higher ambition. There are many ways in which higher usage of rail for freight might be achieved, and higher capital investment might be directed. These include **supply side** measures, increasing the supply and convenience of railfreight services and lowering their cost; and **demand side** measures, which will increase demand for railfreight services.

Increasing the supply of railfreight services

There are several ways in which railfreight services might be increased and improved and costs reduced. These can be categorised as follows:

Further investment in railfreight capacity: this is in effect an expansion of business as usual, with further and faster investment in increased network capacity and capability for freight: resignalling, extra tracks, longer and extra loops, increased height (larger gauge), remodelled junctions (flyovers/underpasses), avoiding lines around stations etc. This mainly amounts to speeding up delivery of the strategic freight network programme as set out in the February 2018 Freight Strategic Plan. This investment has the potential to release significant further suppressed demand through longer, extra and faster trains, which overall would significantly increase the productivity of rail and reduce costs. It should be noted that many schemes would benefit passenger trains as well as freight, such as upgrades to junctions at Ely. As well as this, the "digital railway" programme, being developed by Network Rail, can bring further benefits to freight through better traffic management, and new signalling systems.

Electrification for rail freight: The Government has moved away from support for railway electrification and is putting its faith in bi-mode (diesel/electric, battery/electric or

[34] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/643021/MSRS_Guide_2015_16.pdf

[35] Red diesel is mostly offset by the fact that railfreight pays charges to access the rail network, whilst HGVs pay full tax but no access charge for roads. In addition, as we note later, research suggests that road freight taxation does not fully cover external costs and the impact on road surfaces, so reductions in full costs for rail should be seen in this light

[36] Note: all estimates of future freight trends under all scenarios do not take account of disruption from Brexit in trade and freight flows

hydrogen/electric) combinations for future traction. However, these suffer the disadvantage of increased weight in carrying around diesel fuel, batteries or hydrogen, and to date the power output of battery and hydrogen trains is insufficient for main line freight requirements. Electric traction can be lighter and faster and hence increase productivity – it can also be cheaper and brings environmental benefits (see below). The recent Scottish railfreight industry growth plan points out the benefits electrification can bring in terms of freight capacity: "electric locos improve acceleration [and] get trains to their destination faster for customers, freeing up paths on busy sections of the network. The continued introduction of electric and dual-powered freight locomotives has allowed freight services to be timetabled more efficiently between existing passenger services and, in general, permitted heavier and longer freight services"[37]. One industry commentator has recently proposed a ten-year programme of main line and infill electrification, which could result in 60% of rail freight moving to electric traction[38]. Such a long-term programme would in turn create a compelling business case for freight companies to invest in electric locomotives.

Investment in linking freight sites to the rail network: a barrier to using railfreight is that, for many freight users, direct access to the rail network is either not available or is constrained in various ways, leading to increased costs of access (usually a first/last mile road trip to access a railfreight terminal). This is partly a consequence of many years of planning around road transport for freight, and more recently through deregulation of the planning system. By funding direct links to the rail network for ports, distribution centres or individual major freight users, the cost of access to rail would be reduced, and convenience and attractiveness increased, relative to road. The Freight Facilities Grant, which as noted above was abolished in England in 2011, was aimed at providing capital costs for rail connections and this could be reintroduced, but a more ambitious approach would see a strategic and planned investment programme for planning new rail-connected freight facilities and connecting existing major freight sites to the rail network. This programme should be nationally co-ordinated, linked to the Government's industrial strategy, but could be led by the sub-national transport bodies such as Transport for the North (TfN), working as appropriate with the private sector. In fact, TfN have carried out their own research on freight and logistics which has fed into their strategic plan for the North[39]. A central proposal in this report is for a network of Multi-modal Distribution Parks (MDPs), with public sector funding where necessary, and with "chaining" to ensure they are connected to a single freight route. This is linked to the supportive planning regime for rail freight interchanges described below. A related proposal is made in the Scottish Rail Freight Growth strategy referred to above, which suggests "ring-fencing the value generated by the Network Rail freight estate... The freight estate has potential to become a 'prime mover' supporting future freight network enhancements – offering a direct, incentivised linkage between further development in the scale of freight estate activity and the resultant incomes then supporting freight network enhancements"[40].

Investment in/ support for new types of railfreight services: so far this report has looked at ways to enhance the current model of rail freight provision – dedicated trains carrying rail wagons between purpose-built freight terminals and facilities. There have however been suggestions and proposals,

[37] https://www.networkrail.co.uk/wp-content/uploads/2019/03/Scotland-Industry-Growth-Plan-for-Rail-Freight.pdf p10
[38] http://www.freightonrail.org.uk/PDF/Modern-Railways-April-2018.pdf
[39] https://www.transportforthenorth.com/wp-content/uploads/TfN-Freight-and-Logistics-Report.pdf
[40] https://www.networkrail.co.uk/wp-content/uploads/2019/03/Scotland-Industry-Growth-Plan-for-Rail-Freight.pdf p28

and in some cases niche services and trials, for different models for carrying freight by rail. These include:

- "Piggyback" services carrying lorries or lorry trailers on rail wagons. These are a feature of European freight, where the railway dimensions (the height and width of trains) are generally larger than in the UK[41]. However, a better option might be high gauge swap-body freight, using new technology to ensure easy transfer between rail and road; this avoids the inefficiencies of carrying round unproductive lorry trailers. With investment in increasing the gauge in the UK on the Strategic Freight Network, it is now possible to consider more swap-body services across the UK.
- City centre freight delivered via passenger stations or new consolidation hubs. Given the pressure to improve air quality in cities, getting deliveries by (electrically hauled) rail freight to city centre or edge of cities sites, with onward delivery/ collection by zero-emission road vehicles, could support city regions in their strategies to meet air quality targets. This has been trialled in 2012 and 2014 bringing a train in at night to Euston station in London but not followed up so far[42]. This approach is being used elsewhere; in Paris, five trains a week carry products for the Monoprix supermarket chain from suburban warehouses to the Paris-Bercy freight facility in the city. From there, low emission gas-powered delivery vehicles handle the 'last mile' to Monoprix stores[43].
- High value lower volume freight, including parcels and fresh produce. There are dedicated trains run for the Royal Mail, which carry parcels on a few routes (and with additional services at Christmas), and these have been gradually built up after a period when the Royal Mail ceased using rail entirely. However, there is more interest in the potential for using space on passenger trains. There are in fact some niche services in existence already, carrying sea food on passenger trains from Cornwall to London and high value parcels, mostly linked to the pharmaceutical industry, in the East Midlands, but these have had no Government support[44]. Another operator has recently ordered two trains for a rail-based express parcels service[45]. There has been research for the Government[46] about a more systematic approach to carrying freight on passenger trains, which concluded that there is significant potential, especially with adaptable carriages, and discussion about a bigger and longer trial[47]. Italian Railways FS have in fact introduced a high-speed freight service on this model and plan to roll it out if it is successful[48].

[41] The Channel Tunnel effectively offers a piggyback service for freight, carrying lorries through the Tunnel, as well as some conventional freight trains.

[42] https://www.railwaygazette.com/news/freight/single-view/view/colas-rail-and-tnt-tests-express-rail-logistics.html; http://www.ajhplant.com/freight-trials-continue-at-euston

[43] http://www.urbantransportgroup.org/system/files/general-docs/Delivering%20the%20future%20FINAL%20020315.pdf

[44] https://www.intercityrailfreight.com/

[45] https://www.railengineer.uk/2019/01/07/porterbrook-flex-trains-for-rail-operations-groups-new-parcels-service/

[46] "Carriage of Goods on Passenger Trains", Arups for Department for Transport, 2016

[47] https://ciltuk.org.uk/Portals/0/Documents/Forums/RFG/CILT%20Rail%20Freight%20Forum%20Ed%20Wilson%20NR%2018%2001%202018.pdf?utm_source=GM&utm_medium=email&utm_campaign=RAIL+FREIGHT+FORUM+NEWSLETTER+24+04+2018&utm_term=RAIL+FREIGHT+FORUM+NEWSLETTER+ISSUE+1%2f2018&utm_content=13763&gator_td=pkOeJCo4Yo1bkuzy7uwNgahmA2r2pQ%2bitGsA1dhnjcWhmePxJuKU8F%2bGk80KX2HTas06%2bVSWu8cd2QgoivYJziMIrfVCuVFjHw9VBphPlCs6sQDcA5mnAksIbgqvngD%2fYkORZS4LCfO8kMH3Uxu

The likely demand for these more innovative services is less clear, but potentially could expand the rail freight market significantly. The report on the Carriage of Goods on Passenger Trains calculated that: "10% of the Same Day medium to long distance (best suited to passenger rail) total market would equate to £40 million. If viable, opportunities over shorter distances could realise 5% of the market, equating to £30 million. If 1% of the Next Day and 2 to 3 Day market was viable, this would equate to £68 million". For comparison, the annual turnover of the existing freight operating companies is around £900m[49], so this represents a 15% increase.

This section has shown that there are many options for increasing the provision of attractive railfreight services through investment in capacity and in promoting new services. The costs to the public sector of this investment will be reduced if set out as a long-term investment programme, since this will reduce costs overall. It should also be noted that many of the measures and schemes to support railfreight will have benefits for rail passenger services too. However, the benefits of a long-term investment plan go beyond this. Rail freight as a business – the train operators, the users, those developing and running terminals and the suppliers around these - are very largely in the private sector. They will invest in the business themselves; a long-term investment programme for rail by the Government will provide the certainty to enable and underpin this private sector investment in rail freight.

"Think freight – rail policy": however, there is a basic requirement to make any of this realistic: to ensure railfreight is considered and provisions made for freight services in all decisions affecting the railways. As noted at the beginning of this report, freight on rail in Britain operates as a marginal user within a predominantly passenger railway. Rail decision-making tends to focus on the passenger operators and the needs of passenger services; freight operators and users have had to shout to get their needs considered. In scoping and rescoping investment projects, such as East-West Rail and Trans-Pennine upgrades, provision for freight services has been reduced or excluded to reduce costs. With rail reform once again being considered, and interest in closer alliances or integration between infrastructure owners/ operators and train operators, it would be easy to neglect freight flows (and indeed cross country and regional passenger services) which run across regional boundaries. However the railways are organised and structured, an ambitious policy for increasing railfreight requires that freight services have access to the tracks at a cost and performance that allows railfreight to remain competitive with road freight, and that freight services and needs are catered for in investment programmes and schemes. In addition, given its potential benefits for decongesting roads, investment in rail freight needs to be considered within the context of wider investment in transport infrastructure, which therefore needs to be genuinely multi-modal. We return to this below.

Increasing demand for railfreight services

As well as improving the rail freight "offer" with lower costs and greater efficiencies, it is worth considering measures that can increase demand from freight users for the use of rail.

A0wybuqZdm3evJkIZtMoTm7Sn55BNvZ7TbURY2oInovVVIkVrdmxL9K9UmDkb0Ft00ZfZkjdIRBLxHpCLflMbk28%3d

[48] https://www.railwaygazette.com/news/high-speed/single-view/view/mercitalia-launches-high-speed-freight-service.html

[49] http://orr.gov.uk/__data/assets/pdf_file/0006/26439/uk-rail-industry-financial-information-2016-17.pdf table 2.16

One obvious measure here would be to **increase grants for rail freight**. As noted above, there is a Mode Shift Revenue Support Grant scheme to support railfreight flows that have environmental or other benefits but would not otherwise be economic. This scheme, which currently has very limited funding, could be expanded to support more freight flows and could also operate as a kickstart fund, akin to that used for some bus services, to provide public funding to underpin the start-up phase of new traffic flows on rail. In addition, as suggested above, Freight Facilities Grants could be reintroduced in England to support the capital costs of railfreight facilities for freight users. An alternative approach would be to **reduce access charges for railfreight** to the rail network – in many ways this would better than specific grants as all freight users would benefit. Germany has done this as part of a policy to increase rail freight[50]. Those working in the freight industry say that even small changes in costs of railfreight can switch large amounts of traffic from road to rail – "some flows like Southampton to Daventry tend to move to rail in the autumn when road vehicles and drivers are in short supply but go back to road when demand eases post- Christmas"[51].

However, ambitious targets for increasing rail freight can also be supported by wider policy changes.

Road pricing: road user charging has been much discussed in general as an instrument of transport policy reform, but there is a separate case to be made for charging HGVs specifically. In fact, HGVs are already subject to a form of charging. The HGV levy, which was introduced in 2014, is aimed at equalising competition between UK- and foreign-registered vehicles, ensuring that all contribute towards the cost of the roads they use[52]. The levy, which is time-based, applies to all HGVs, but UK hauliers pay it as part of their vehicle excise duty. The Government is reviewing the levy and has raised the possibility of moving towards a distance-based charging scheme[53]. Many other countries now have such charging systems for lorries. In Europe, there are several countries with tolls on HGVs by distance, including Germany, Austria and Switzerland. Some US states also charge HGVs by distance and weight, and New Zealand also has HGV road user charges.

A similar distance-based charging scheme, depending on its design and the levels of charge, could result in a significant increase in rail's mode share of freight. The German charging system, known as the MAUT, introduced in 2005, resulted in a 12% increase in rail freight[54]. Charging in Germany and Austria has also reduced empty running by lorries – in Germany distance-based charging reduced empty running by 11% to around 18% and reduced tonne kilometres because of better loading rates. Prior to its introduction, Germany had empty running levels similar to the UK (around 28%).

What might be the effect of road charging for lorries on rail freight? A 2007 study for Campaign for Better Transport (then Transport 2000) by MDS Transmodal modelled this, using the Government's own freight transport model. It suggested that HGV charging could result in a 5% increase in mode share for rail for freight above the trend – 18% against 13% in policy-neutral scenario. The study looked at the impacts on different regions and concluded that "in all regions rail freight [would increase] its share of the freight market, but the most significant increases would be in regions with

[50] https://www.railwaypro.com/wp/ec-approves-germanys-state-aid-to-support-road-to-rail-freight-shifting/
[51] Personal communication
[52] https://www.gov.uk/government/collections/hgv-road-user-levy
[53] https://www.gov.uk/government/consultations/reforming-the-heavy-goods-vehicle-road-user-levy
[54] https://bettertransport.org.uk/sites/default/files/research-files/Lorry%2BUser%2BCharging%2BFull%2BReport.pdf

deep sea container ports or major conurbations, as the main source of growth is likely to be in intermodal rail freight"[55].

While the current proposals for reforming the HGV levy, and indeed previous proposals for HGV distance charging, are based on the idea that it should be revenue neutral for hauliers, with reductions in other taxes to compensate for the levy, there is a case for increasing the levels of taxation paid by HGVs. This is because, as the 2007 MDS report points out, the heaviest HGVs do not pay the full costs they impose on society. We cover this issue below in discussing the benefits of increasing railfreight, but it is worth noting here that MDS's road pricing modelling used the Government's own valuations of net external costs to calculate the additional charges over and above existing taxation. "Road haulage taxation, including all net externalities, would therefore have a distance-based element and would vary according to the type of road and, in particular, its level of congestion. The level of the charges would be significantly higher on congested sections of the road network than the current level of taxation. For example, over and above tax paid through fuel tax and vehicle excise duty, the charge would be £0.69 per HGV mile on a highly congested motorway and £1.74 per mile on a minor road in a major city. However, the charge would only marginally increase user costs on a low congestion motorway, with an additional cost of £0.04 per mile"[56]. As noted above, these are based on the Government's own valuations, and may undervalue some externalities, for example the contribution HGVs can make to motorway congestion (see below). It should be noted that this was a deliberately simple modelling exercise, and pre-dated the time-based system introduced in 2014, but it does show the potential. In the modelling, rail freight would increase by almost 50% more with road pricing compared with the business as usual scenario. Because distance-based road user charging would target longer distance road flows, this would support rail's natural advantage on those flows, with road haulage catering for more local transport.

A supportive planning regime for rail-linked freight facilities: the importance of rail-linked freight facilities in increasing the use of rail for freight was noted above. This requires a supportive national and regional/ local planning regime. The National Policy Statement on National Networks[57] offers some support for strategic railfreight interchanges but stops short of being specific on sites outside the South East. The current version of the National Planning Policy Framework[58], which sets the background for local planning decisions, mentions lorry parking but does not mention railfreight. Both the NPS and NPPF could be revised to give more support for locating and designing logistic and freight developments so that they can be rail served. These could for example require all new large-scale warehouse developments to demonstrate that connection to the rail network has been properly assessed, as the default position. In the event of rail connection not being possible a contribution to a modal shift fund could be required. This would push major new warehouses (and other similar large generators of freight) to be sited at rail connected sites, particularly Strategic Rail Freight Interchanges, where there is the critical mass to provide enough demand to support a range of rail services, inbound from the ports and outbound to Regional Distribution Centres and stores. This would be achieved by repurposing existing rail-connected brownfield sites such as power stations and Ministry of Defence depots, as well as some new sites alongside the key rail routes with good road connections for onward deliveries.

[55] https://bettertransport.org.uk/sites/default/files/research-files/road_pricing_freight.pdf
[56] ibid
[57] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/387222/npsnn-print.pdf
[58] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/740441/National_Planning_Policy_Framework_web_accessible_version.pdf

As noted above, sub-national transport bodies can help with this – as Transport for the North has already done – by setting out the strategic case for railfreight facilities and interchanges. But such bodies do not have formal planning powers. Transport for London and some other city-region and combined authorities do have spatial planning powers; the Mayor of London must prepare a London Plan and the Mayor's Transport Strategy and can use these to support railfreight. Spatial plans are also being drawn up by mayors in Greater Manchester and the Liverpool City Region. The March 2019 Scottish rail freight growth strategy includes a suggestion for enhancing Scottish planning guidance to support rail-linked freight facilities.

Restrictions on diesel freight vehicles in cities: as part of air quality management plans, cities are increasingly looking at restrictions or charges on diesel-powered heavy vehicles, including HGVs. Such restrictions and charges can increase the viability of alternative logistics frameworks involving rail, including urban consolidation centres or multi-modal distribution parks outside the central areas, which can be rail served with onward delivery by low- or zero-emission vehicles, as well as direct delivery of goods by train into city centre railway stations (see above). These are not mutually exclusive – each caters for a different type of supply chain operation.

Better regulation of road freight: rail is highly regulated for safety purposes and has in recent years had a good safety record. Road freight is in theory also highly regulated, but statistics suggest that some regulations are flouted. Roadside checks on UK HGVs in 2016 resulted in 27.8% of those stopped facing prohibitions for mechanical issues, 39.1% failed weight checks and 5.1% exceeded drivers' hours limits[59]. These checks by the Driver and Vehicle Standards Agency target enforcement activity at operators most likely to be non-compliant, so these figures are not necessarily representative of the freight industry as a whole. However, even low levels of illegality represent unfair competition with rail by artificially reducing road haulage costs – tougher enforcement of road haulage regulation could therefore improve rail's competitive position, as well as improve working conditions for road haulage drivers.

"Think railfreight – industrial strategy": we noted above the importance of ensuring that railfreight is considered and allowed for in rail policy. To achieve an ambitious target for increasing the use of railfreight, it is also important that railfreight is considered in the Government's wider industrial strategy, including in all regulation, planning and taxation measures applying to the freight and logistics sector but also in policy for other sectors of the economy such as ports, automotive, energy and construction. This should include advocacy for rail use and proactive measures to encourage take up. Again, such an approach will promote and encourage private sector investment in the railfreight industry.

Benefits of an ambitious railfreight strategy

So far, this report has set out the investment and measures that could increase the carriage of goods by rail and rail's share of the GB freight market. However, this will need to be supported by an assessment of the benefits of such a strategy. Why should such a strategy be adopted? In looking at increased ambition, there are some clear benefits from increased rail freight.

Reduced congestion: a shift of freight from road to rail could reduce congestion on the roads. The feasibility of this has been established by a study by consultants MTRU for Campaign for Better Transport[60]. This showed that it would in principle be feasible to transfer at least 2000 lorries a day

[59] https://fta.co.uk/CMSPages/GetFile.aspx?guid=2e8a35f0-c853-4f90-90d8-1ee9fbeb53c6&lang=en-GB
[60] https://bettertransport.org.uk/sites/default/files/research-files/cross-modal-freight-study.pdf

to rail on key routes to ports (Felixstowe and Southampton were studied) and on major motorways in the Midlands and North. The report notes that this would in practice reduce overall road congestion by more, since the biggest HGVs take up more road space and have a greater impact on congestion because of their acceleration, deceleration and braking characteristics. This means that each HGV represents 3-4 "passenger car units" (pcus) on a congested road. Applying this to specific corridors, the report estimates a reduction in traffic on the A34 Southampton-Newbury road of 12-16% and 17-19% on the A14 Felixstowe-Cambridge route. On the M6, the report finds, assuming a transfer rate of 20% of HGVs to rail, reductions of over 2000 lorries a day are achievable. It refers to the Northern Freight and Logistics Report as showing potentially larger reductions of 2700-5500 HGVs/day on the M6 corridor by 2033. The M62, with shorter distance freight flows, could see smaller but still significant reductions in HGVs and hence overall congestion.

However, the report makes it clear that this transfer depends on railfreight capacity being available. This reinforces the case made above for supply-side investment in railfreight capacity and capability, but also shows that this investment should be considered as part of overall infrastructure spending; it can and should be considered as an alternative to road-only options for tackling congestion on some major road corridors. This ambitious scenario would therefore require a more multi-modal approach to infrastructure spending and management, especially on interurban transport, than has been the case in recent years. By contrast, investment in road building without investment in rail freight capacity is likely to damage the growth prospects for rail freight – as a 2014 report for the Scottish Government by AECOM into the upgrade of the A9 Perth-Inverness trunk road noted, "realistically the shorter journey times and improved reliability and resilience offered by the A9 dualling are going to lessen the potential switch from road to rail and all other things being equal, are likely to constrain future rail freight growth"[61].

Increased efficiency: the ambitious scenario has clear benefits in terms of increased efficiency within the freight and logistics industry. We have already noted the increased efficiency and productivity within the railfreight industry from investment in capability (longer, faster and heavier trains) and capacity. However, there would also be benefits for the whole logistics and freight sector in terms of reduced mileage and increased utilisation for lorries, especially with HGV charging – we noted above evidence from Germany that distance charging for lorries there resulted in a sharp fall in empty running, as well as an increase in rail freight.

Environment: current freight and logistics patterns impose significant environmental costs. Specifically, HGVs add to air pollution, in terms of nitrogen oxides and particulates. This pollution is not purely from exhausts; tyres and brakes produce particulates also and with the latest engine technology these emissions exceed exhaust emissions. These pollutants are linked to a wide range of serious health problems.

HGVs also contribute to carbon emissions; Government statistics show that in 2017 the 400,000 or so HGVs were responsible for around 16.5% of transport emissions, or around 6% of total domestic UK carbon emissions[62]. Within this, the big articulated vehicles play a major role – one study has estimated that they account for more than 10 per cent of all transport emissions and this could rise

[61] https://assets.documentcloud.org/documents/4060793/A9OBC-Tech-Note-12-Freight-Corridor-Assessment.pdf p32.

[62]Department for Business, Energy and Industrial Strategy (2019), 2017 UK greenhouse gas emissions: final figures https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-2017

to over 15 per cent by 2030[63]. The National Infrastructure Commission has proposed that all freight should decarbonise by 2050 and that diesel freight vehicles should not be sold after 2040[64]. However, the projected growth in emissions illustrates that, unlike cars and vans, decarbonising trucks, especially the heaviest trucks, is more difficult technically and is also costly, even with the predicted development of battery and hydrogen vehicles. A policy of promoting a transfer of freight to electrically hauled trains can therefore play a major role in decarbonising the freight and logistics sector, and hence can be a key element in overall strategies to reduce carbon emissions. It has been estimated that a combination of increased rail use and mode share could, when combined with road user charging for lorries, stabilise HGV vehicle mileage at 2010 levels by 2030, saving 2.5millon tonnes of carbon dioxide equivalent[65]. Another estimate has suggested that a combination of measures could result in 10.5m tonnes of carbon dioxide equivalent per year, equivalent to 40% reduction in total HGV emissions.

Such a strategy would also have air quality benefits; the study referred to above on reduced congestion on key strategic roads has also estimated[66] that the transfers to rail in the four corridors studied would reduce NOx in those corridors by 10% and particulates by 7% and see a reduction in carbon from all HGVs nationally by 2.5%. This does not allow for road charging, which the report on this previously cited suggests could reduce carbon and other pollution, and other environmental impacts[67].

Road safety: there are potentially large road safety benefits from increasing rail freight and reducing HGV traffic. Government figures show that HGVs are nearly five times more likely than cars to be involved in fatal collisions on minor roads, and almost four times more likely on motorways. Across all road types HGVs are almost three times more likely to be involved in fatal collisions than cars[68].

Road maintenance costs: HGVs cause more damage to foundations and structures of roads than cars because the damaging power rises exponentially as weight increases. This is called the ***Generalized Fourth Power Law***. The standard six-axle 44 tonne 16.5 metre truck is 100,000 times more damaging to road surfaces than a Ford Focus. This means that some of the heaviest road repair costs are therefore almost exclusively attributable to the heaviest vehicles and HGVs are currently only paying 11% of their road damage costs[69]. A shift of freight from road to rail will result in savings on road maintenance.

Benefits of an ambitious railfreight strategy to the economy

This section has shown that there are benefits from an increased railfreight strategy in terms of congestion, environment, safety and road maintenance. These benefits from increased rail freight can be turned into economic values using conventional transport appraisal methodology, which is used in assessing transport schemes including applications for railfreight grants. This methodology has been used by Network Rail to assess the benefits of unconstrained growth in railfreight with

[63] https://bettertransport.org.uk/sites/default/files/pdfs/Tracks-Carbon-Reduction-Report-2017.pdf
[64] https://www.nic.org.uk/wp-content/uploads/Better-Delivery-April-2019.pdf
[65] https://bettertransport.org.uk/sites/default/files/pdfs/Tracks-Carbon-Reduction-Report-2017.pdf
[66] https://bettertransport.org.uk/sites/default/files/research-files/MTRU-supplementary-report-on-impacts-of-rail-freight-december-2017.pdf
[67] https://bettertransport.org.uk/sites/default/files/research-files/road_pricing_freight.pdf
[68] http://www.freightonrail.org.uk/FactsFigures-safety.htm
[69] https://bettertransport.org.uk/sites/default/files/18.03.26.MTRU-HGVs.pdf

increased investment in capacity, compared with the scenario where growth is constrained through lack of investment. The Network Rail report notes[70]:

> "What is notable, based on the lost growth from the pro-rail scenarios, is that there are corresponding lost economic benefits from modal shift. Using approximate values of mode shift benefits (reflecting the environmental and social costs of HGV journeys) gives a lost value of up to £89 million per annum. Using WebTAG assumptions, this reveals lost mode shift benefits [between 2016-7 and 2023-4] of between £1.7bn and £4.7bn (depending on chosen constrained growth scenario). This provides further justification for the case for freight network enhancements set out elsewhere in this plan."[71]

There are also some overall estimates on employment and wider economic benefits from increased use of rail. Transport for the North's work by MDS Transmodal gives some estimates of economic benefit using economic and transport modelling. Its appraisal suggests that by 2033 "the increase in multi-modal distribution parks will create between 25,000-38,000 jobs in the North of England, as a result of a reduction in freight transport costs and the resultant increase in competitiveness as a location for advanced manufacturing activity and inward investment"[72]. It calculates that this is worth £13-£20bn in benefits to the UK economy over the period 2018-2033. In addition, it suggests that its package of measures will result in reduced costs to users and reduced environmental, congestion and other externalities, which together are worth £34.7bn.

Multiplying these benefits to take account of such a strategy and package of measures being rolled out GB wide is not straightforward, because the potential for railfreight expansion is not equal in every part of the country. Other Sub-National Transport Bodies have not yet developed a freight strategy comparable to that from Transport for the North. Nonetheless, the principles from the TfN study – multi-modal distribution parks around cities, investment in railfreight capacity (longer, faster trains with more paths available), investment in port infrastructure – would be applicable elsewhere. However, there is a broad approach to calculating a national figure. Research by KPMG for the Rail Delivery Group finds that the North West, North East and Yorkshire and Humber regions together account for 43% of the total economic benefits from railfreight[73]. This gives a multiplier for national benefits.

To these can be added the benefits from lorry road user charging, and recycling revenues from that to support efficiency in rail and improved standards in road. The distribution parks will also be more successful if complemented by restrictions on diesel vehicles in cities and by new forms of railfreight which can take it into new markets. In addition, increased enforcement of road freight regulation and a supportive planning regime are complementary measures but are difficult to quantify in terms of increased railfreight and wider benefits. To give an indication of these, a multiplier of 50% has been assumed (this fits broadly with the modelling of road pricing in the MDS 2007 report).

Summary, recommendations and conclusions

This report attempts to set out, using the available literature, an ambitious growth scenario for railfreight and the likely economic, social and environmental benefits from pursuing such a scenario. It finds that such a scenario is achievable in principle and would bring a range of benefits including

[70] https://cdn.networkrail.co.uk/wp-content/uploads/2018/02/FNPO-Route-Strategic-Plan.pdf
[71] These WebTAG assumptions incorporate reduced congestion and various environmental benefits, similar to the valuations used for Mode Shift Revenue Grants.
[72] https://www.transportforthenorth.com/wp-content/uploads/TfN-Freight-and-Logistics-Report.pdf 7.2
[73] https://www.raildeliverygroup.com/files/Publications/2018-06_rail_freight_working_for_britain.pdf

reduced congestion, increased employment, reduced carbon emissions and improved air quality and road safety. To achieve these benefits would require different public funding and policy frameworks to those now in place: higher levels of capital investment and revenue support and other complementary policies supporting an increase in freight transport by rail and in rail's share of total freight transport. Such an approach would encourage further significant private investment in railfreight services and terminals.

Bringing together the evidence gathered from the literature shows clearly the interventions that would contribute to achieving this ambitious railfreight scenario. Research by Arup[74] confirms that the most effective measures in terms of impacts on road and rail freight are investment in rail infrastructure (a strategic freight network, plus capacity and gauge enhancements), increased grants, and "cross government policy intervention", representing supporting measures such as reintroducing the road fuel duty escalator. Research for Transport for the North[75] and others identifies rail freight interchanges and linking freight sites to the rail network as important determinants, especially if complemented by restrictions on diesel vehicles in cities. New forms of rail freight services, including express parcels on passenger trains, could also contribute to achieving the ambitious growth scenario.

This leads to a series of conclusions and recommendations:

- **Invest in a strategic rail freight network**: increased capacity and gauge enhancements across the rail network to release suppressed demand for railfreight. Plans for this investment have been drawn up by Network Rail and the freight operating companies[76]
- **Electrify railfreight**: in addition to the investment in capacity and gauge enhancement, invest in a sustained rolling programme of infill electrification over 10 years to create a strategic electric freight network covering 60% of railfreight services[77]
- **Promote and where appropriate invest in linking freight sites to the rail network**, including a network of multi-modal distribution parks. Alongside this, amend national planning policy to actively support railfreight, for example by requiring freight generators like warehouses to be located at rail-connected sites
- **Invest in new types of railfreight services** including high gauge swap body freight, city centre freight services to stations[78] and consolidation hubs, and freight on passenger trains, especially high value lower volume freight like parcels and fresh produce. These could link with restrictions on diesel trucks and vans in cities, already being planned by many cities as part of Clean Air Zones
- **Increase grants for railfreight and/or reduce access charges** (as Germany has recently done). There are already limited grants available to support railfreight flows, and grants to support investment in railfreight facilities could be reintroduced.

[74] https://www.arup.com/-/media/arup/files/publications/f/future_potential_for_modal_shift_in_the_uk_rail_freight_market.pdf
[75] https://www.transportforthenorth.com/wp-content/uploads/TfN-Freight-and-Logistics-Report.pdf
[76] https://cdn.networkrail.co.uk/wp-content/uploads/2018/02/FNPO-Route-Strategic-Plan.pdf
[77] http://www.freightonrail.org.uk/PDF/Modern-Railways-April-2018.pdf
[78] https://www.railwaygazette.com/news/freight/single-view/view/colas-rail-and-tnt-tests-express-rail-logistics.html; http://www.ajhplant.com/freight-trials-continue-at-euston

Mainstreaming railfreight in transport and industrial policy: alongside these specific measures, an ambitious scenario for railfreight requires more general Government support, through making railfreight part of the mainstream of transport policy and industrial strategy. However the railways are organised and structured, an ambitious policy for increasing railfreight requires freight services to have access to the tracks at a cost and performance that allows railfreight to remain competitive with road freight, and railfreight needs to be fully considered and included in the structures, strategies and investments in the rail industry. Investment in railfreight, especially in the Strategic Rail Freight Network, should be considered as part of overall infrastructure spending. Research (some of it sponsored by the Government) has clearly shown that increasing the use of railfreight could on some corridors be a very effective measure in tackling road congestion, so investment in railfreight can and should be considered as an alternative to road-only options for tackling congestion on some major road corridors. This ambitious scenario would therefore require a more multi-modal approach to transport infrastructure spending and management, especially on interurban transport, than has been the case in recent years.

It is also important that railfreight is considered in the Government's wider industrial strategy, including in all regulation, planning and taxation measures applying to the freight and logistics sector but also in policy for other sectors of the economy such as ports, automotive, energy and construction. Research by Transport for the North and others suggests that this can bring large economic and industrial benefits. Freight is a largely private sector, privately run business – such Government support can result in significant private investment in freight terminals, and railfreight trains and services.

Road pricing for lorries: the benefits of the investment in and support for railfreight for this ambitious scenario will be enhanced if accompanied by distance-based road pricing for HGVs. HGVs in the UK are already subject to a time-based levy, and the Government has discussed the option of moving towards a distance-based charge[79]. Many other countries already have such a charge and moving in this direction could result in a further significant increase in railfreight, especially if the charge were designed to recoup the full costs HGVs impose on society, with extra charges rather than being revenue neutral. Because distance-based road user charging would target longer distance road flows, this would support rail's natural advantage on those flows, with road haulage catering for more local transport. Of course, road user charging for HGVs could raise significant revenue - £6.7bn if external costs are charged (2007 prices)[80].

The study has shown that there are benefits from an increased railfreight strategy in terms of reduced congestion and environmental impacts, (including faster decarbonisation of the freight sector), improved road safety and better road maintenance; there are also broader economic and employment benefits. The Arup report suggests that the combination of all these measures could save 40% of the annual CO2 emissions from HGVs.

The table below shows the different interventions and their likely cost in terms of public funding, likely impacts on railfreight and the wider benefits. It also includes a multiplier of 50% to represent impacts of road pricing or similar measures. Clearly these numbers are indicative rather than precise – but they are a reasonable guide to the likely costs and benefits of packages of investment and interventions to support railfreight. An additional table setting out detailed calculations is attached as an Appendix to this report.

[79] https://www.gov.uk/government/consultations/reforming-the-heavy-goods-vehicle-road-user-levy
[80] https://bettertransport.org.uk/sites/default/files/research-files/road_pricing_freight.pdf

Policy Intervention	Amount of public funding	Impact on railfreight	Wider economic, social and environmental benefits	Total benefits if enhanced with HGV road pricing multiplier[81] or equivalent (50%)
Fund current plans for strategic investment in rail freight capacity	£0.6-1.1bn CP6; £2.9bn-6bn CP7[82]	Unlocks higher growth in railfreight; up to 49% growth in tonnes lifted 2016/7-2023/4, 60% growth by 2043 (railfreight currently 9% mode share[83] so this means growth to 13.5%)	[£89m per year]; Monetary benefit: £1.7-4.7bn overall over 7 years.[84] Non-monetary benefit: 15.01bn tonne km per year reduced road freight by 2030 (=10.2 % of current road freight) and carbon reduction 0.42mt CO2e/year[85]	£2.5-7.0bn over 7 years, plus increased environmental benefits of £0.4bn

[81] Multiplier derived from Transport 2000/MDS (2007) study, which, using the same model as used by the DfT, indicates that a distance-based HGV levy set at a level to cover the full external costs of HGVs would result in approximately 50% uplift in rail freight volumes above business as usual. See main text p8 https://bettertransport.org.uk/sites/default/files/research-files/road_pricing_freight.pdf

[82] Ranges represent uncertainties in scheme delivery costs, not differences in number of schemes or specifications. It is unclear what proportion of this funding is currently included in Government spending plans. Enhancements were excluded from the Statement of Funds Available for 2019-24 Control Period 6, leaving them to be funded as and when DfT and Treasury see fit. Funding is completely uncertain for 2024-29 Control Period 7. For the purposes of this analysis, we assume Network Rail and partners have capacity to deliver the enhancements they have identified as part of their strategy.

[83] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/787488/tsgb-2018-report-summaries.pdf; https://www.gov.uk/government/statistical-data-sets/tsgb04-freight#domestic-freight-transport, table TSGB 0403

[84] https://cdn.networkrail.co.uk/wp-content/uploads/2018/02/FNPO-Route-Strategic-Plan.pdf These WebTAG assumptions incorporate reduced congestion and various environmental benefits, similar to the valuations used for Mode Shift Revenue Grants.

[85] Arup estimate reduced road freight of 6.31bn tonne km and a reduction in carbon of 0.48 mt carbon/year (0.18mt CO2e/year) by 2030 (on a 2016 baseline) from an investment in the Strategic Freight Network and 8.70bn tonne km and 0.66mt carbon/year (0.24 mt CO2e) from investment in capacity and gauge enhancements https://www.arup.com/-/media/arup/files/publications/f/future_potential_for_modal_shift_in_the_uk_rail_freight_market.pdf

Policy Intervention	Amount of public funding	Impact on railfreight	Wider economic, social and environmental benefits	Total benefits if enhanced with HGV road pricing multiplier[81] or equivalent (50%)
Commit to a sustained rolling programme of infill electrification to create a strategic electric freight network	£1bn spend - £100m per year for 10 years[86]	Reduced operating costs and increased capacity	Non-monetary benefits: 349,000 tonnes less CO2 per year (0.35 mt CO2) at 50% electric railfreight[87]. Enables decarbonisation of rail and wider freight industry	N/A
Link freight sites to the rail network and other measures [88]	£2.9bn TfN [89]package 2018-33 (national spend pro-rata £6.7bn)[90]	32.7m extra railfreight train km/year (72% extra) and 56m extra railfreight tonnes/year (56% extra) 2018-2033 compared with business as usual (= 42% increase on 2014 railfreight tonnes)	Monetary benefits: £13-20bn economic benefits[91] (£30-47bn nationally), 25000-38000 jobs (58000-88000 nationally), plus £34bn user and environmental benefits (£79bn nationally), carbon reduction estimate 1.5 mt CO2e/year[92]	£19-30bn economic benefits, £51bn user/ environmental benefits

[86] Note this is additional to the strategic investment in railfreight capacity and could in many cases be shared with passenger service electrification

[87] Arup ibid

[88] This is based on the freight and logistics research for Transport for the North, which modelled a series of Multi-Modal Distribution Parks and other land use planning and investment.https://www.transportforthenorth.com/wp-content/uploads/TfN-Freight-and-Logistics-Report.pdf

[89] TfN = Transport for the North

[90] https://www.raildeliverygroup.com/files/Publications/2018-06_rail_freight_working_for_britain.pdf. This takes KPMG figures showing that regions in the North of England together account for 43% of the total economic benefits from railfreight. This gives a multiplier for national benefits and has been used as an indicator for costs as well.

[91] From TfN study reference 13

[92] This is using carbon savings estimates from https://www.arup.com/-/media/arup/files/publications/f/future_potential_for_modal_shift_in_the_uk_rail_freight_market.pdf, table 7.5, for new and refurbished terminals, land safeguarding and consolidation centres. Note that these are by 2030 on a 2016 baseline, whereas the TfN measures are calculated for 2018-33.

Policy Intervention	Amount of public funding	Impact on railfreight	Wider economic, social and environmental benefits	Total benefits if enhanced with HGV road pricing multiplier[81] or equivalent (50%)
Support new types of rail freight services	Unclear, but could be included passenger rail service specifications and NR programmes	Up to £138m of extra revenue (15% addition to current freight operating companies' turnover)[93]	Reductions in vehicle numbers on road and opportunities for sustainable first/last mile	£207m extra revenue
Increase railfreight grants and/or reduce access charges	Increased grants budget to £50m/year	Increased use of railfreight (4.64bn tonne km per year, +27%), reduced road freight (4.91bn tonne km per year, -3.4%) 2016-2030[94]	Reduction of 378,624 tonnes of carbon per year by 2030, = 1.4mt CO2e	
TOTAL over 7 years (capital) (revenue)	£6.28-8.8bn £350m	Up to 49% increased rail freight tonnage Est 12.6% tonne-km	£52.6-63.5bn	£78.9- 95.3bn
TOTAL over 10 years (capital) (revenue)	£8.97-12.57 £500m	Up to 79% increased tonnage[95] Est 18% increased tonne-kms	£75.1-90.7bn[96]	£112.64-136.1bn

Note: this report was prepared by Stephen Joseph Associates for the Rail Freight Group. Thanks for comments and suggestions on earlier drafts are due to Maggie Simpson, Peter Frost, Mike Garrett, Ian Taylor and Julian Worth.

[93] "Carriage of Goods on Passenger Trains", Arups for Department for Transport, 2016

[94] Figures from https://www.arup.com/-/media/arup/files/publications/f/future_potential_for_modal_shift_in_the_uk_rail_freight_market.pdf

[95] Calculations based on pro-rata increase in railfreight tonnage carried, with capacity increases and linking freight sites to the rail network, over the 7 and 10 years respectively.

[96] Calculations based on pro-rata benefits in increases in capacity and economic, user and environmental benefits from linking freight sites to the rail network, over 7 and 10 years respectively

Appendix 1: Expanded spreadsheet version of inputs-outcomes table with methodological notes (Excel file available on request)

Rail Freight Ambitions Report

Excel expanded version of Summary Table

All figures in £ millions or £ millions per year

Policy Intervention	Amount of public funding			Impact on railfreight		Monetised economic, social and environmental benefits		Total financial benefits if enhanced with HGV road pricing multiplier[1] or equivalent (50%)			Non-financial benefits to rail freight (no HGV road pricing)				Reduction in road freight (no HGV road pricing)		Reduction in road freight (with HGV road pricing)	Climate benefits (no HGV road pricing)	Climate benefits (with HGV road pricing)
	Capital (£m) over 7 yrs		Revenue (£m/yr)	Turnover uplift (£m/yr) at 7 yrs	Turnover uplift (%) at 7 yrs	Total financial benefit (£m) over 7 yrs		Total financial benefit over 7 years (£m)		Yearly turnover benefit (£m/yr)	Uplift (bn tonne-km/yr) at 7 yrs	% uplift (tonne-km/yr) at 7 yrs	Uplift (m tonnes/yr lifted) at 7 years	% uplift (tonnes/ yr lifted) at 7 yrs	Reduction in road freight at 7 yrs (bn tonne-km/yr)	Reduction in road freight at 7 yrs (%)	Reduction in road freight at 7 yrs (%)	Reduction in $MtCO_2$ over 7 years	Reduction in $MtCO_2$ over 7 years
	Low end cost to achieve	High End cost to achieve				Min (for either Low or High end spend)	Max (for either Low or High end spend)	Min (for either Low or High end spend)	Max (for either Low or High end spend)										
Fund current plans for strategic investment in rail freight capacity	2450	4970		338	38%	1700	4700	2550	7050		7.3	38%	53.0	49%	7.51	5%	8%	7.4	11.0
Commit to a sustained rolling programme of infill electrification to create a strategic electric freight network	700	700		?	?													0.9	1.3
Link freight sites to the rail network and other measures	3127	3127		176	20%	50867	58800	76300	88200		2.6	13%	21.2	20%	2.70	2%	3%	2.7	4.0
Support new types of rail freight services			Cost-free?[2]	138	15%					207									
Increase railfreight grants and/or reduce access charges			50	122	14%						2.3	14%	7.4	8%	2.39	2%	2%	2.4	3.6
TOTAL (7yrs)	**6277**	**8797**	**350**	**773**	**86%**	**52567**	**63500**	**78850**	**95250**		**12.2**	**64%**	**81.6**	**69%**	**12.6**	**8%**	13%	**13.3**	**19.9**
TOTAL (10 yrs)	**8967**	**12567**	**500**	**1105**	**122%**	**75095**	**90714**	**112643**	**136071**		**17.5**	**92%**	**116.6**	**98%**	**18.0**	**12%**	**18%**	**27.1**	**40.7**
TOTAL (5 yrs)	**4483**	**6283**	**250**	**552**	**61%**	**37548**	**45357**	**56321**	**68036**		**8.7**	**46%**	**58.3**	**49%**	**9.0**	**6%**	**9%**	**6.8**	**10.2**

Notes:

[1] Multiplier derived from Transport 2000/MDS (2007) study: using same model as DfT indicates distance-based HGV levy set to cover full external costs of HGVs creates c. 50% uplift in rail freight volumes above business as usual. (See main texts p.13) https://bettertransport.org.uk/sites/default/files/research-files/road_pricing_freight.pdf

[2] May not require public funding if required of passenger rail as use of spare capacity?

List of comment bubbles in e-version of Excel sheet by cell reference:

E6	This column backfilled assuming turnover is, to a first order estimate, proportional to annual tonne-km, to give indicative figures.
F6	To first order, assume same as tonne-km uplift.
M6	Arup figures suggest this should be 37.5% increase in rail tonne km and a reduction in road freight of 5%. Uplift is against 2016 baseline.
O6	Network Rail figures.
S6	Cumulative CO_2 benefit calculation requires multiplying the annual CO_2 saving as at 3.5 yrs - the average to the 7 yr point. Thus, a factor of 0.25 applied to the final 14 yr annual saving.
S7	0.349 $MtCO_2$/yr reduction taken to be annual saving after 10 years using Modern Railways article, combined with Arup figures. Cumulative benefit at 7 years uses 7*3.5 year average = 3.5/10, presuming builds linearly with the electrification programme.
F8	To first order, assume same as tonnes lifted uplift.
L8	Based on 4 interventions listed by Arup, 14 year timescale with linear growth.
O8	Based on TfN report with 17 year timescale.
P8	From Arup, 14 years, and can treat linearly.
S8	Based on 4 interventions assessed by Arup for annual CO2 benefits at 14 yr. Calculated using average uplift to 7 years (i.e. 3.5 years figure).
E9	=c.15% addition to present railfreight turnover of £900m
S9	No numbers available.
F10	To first order, assume same as tonne-km uplift.
P10	Backfilled by comparison with data from other rows.
Q10	Backfilled by comparison with data from other rows.
S10	Converting from tonnes carbon to tonnes CO_2=*(16+16+12)/12=3.5
S11	cf Transport sector emissions of 126$MtCO_2$ per year, of which HGVs account for 21MtCO2 per year - i.e.£147$MtCO_2$ over 7 years.