FREIGHT STUDY

APPENDIX B: IMPACT AND COSTING NOTE

NATIONAL INFRASTRUCTURE COMMISSION

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Introduction

This note covers the recomendations in the Commission's Freight Study recommendations with significant spending implications.

It assesses:

- the impact of the recommendations on the Commission's objectives to support sustainable economic growth across all regions of the UK, improve competitiveness and improve quality of life
- the expected costs of the recommendation, and their impact on the Commission's fiscal and economic remits
- uncertainty, distributional effects and risks around these estimates and the balance of evidence behind recommendations, as far as it has been possible to make these assessments.

The impact and costing note records the Commission's assessment of these factors in a standard format.

The core of each impact and costing note is how the cost of the recommendation affects the Commission's fiscal and economic remits. These were set out by government in 'Remit Letter to the National Infrastructure Commission'. [1]

Freight

The recommendations which are costed in this note are as follows:

Recommendation 1: Government should commit to decarbonising road freight by 2050, including:

- Announcing in the next two year a plan to ban the sale of new diesel powered HGVs no later than 2040.
- An assessment of the infrastructure required to enable uptake of battery electric or hydrogen HGVs.
- An assessment of the grid reinforcement and smart charging requirements for van fleets.

Recommendation 2: A strategy for zero emissions from rail freight.

NIC Objectives

Sustainable growth	Lower cost of driving electric vans and zero emission road and rail freight may support economic growth with lower environmental impacts, which will be essential to meeting the UK's climate change targets. Road and rail freight transport is responsible for nine per cent of the UK's greenhouse gas emissions.
Balance across regions	No quantifiable impact on regional growth has been identified.
Competitiveness	Zero emission HGVs and vans could have lower operational costs, possibly reducing the costs of freight transport and supporting the UK's competitiveness and productivity.
Quality of life	Pollution: Where recommendations support the faster take up of zero emission HGVs and vans this will lead to reduced localised air pollution and noise. User experience: zero emission / electric freight vehicles may benefit drivers and operators if they are easier to drive and maintain with lower costs of operation.

Freight

Fiscal remit

Recommendation 2

The different options for decarbonising rail freight explored in the report would be likely to involve government capital expenditure, or risk incurring additional congestion costs.

It is estimated that rail freight removes 1.7 billion kilometres of HGV mileage from the roads each year, around six per cent of HGV mileage in 2017. [2] Replacing all current rail freight with HGVs could mean an increase of one per cent on all major roads (motorways, urban and rural A-roads), or a two per cent increase in traffic using the SRN. [3]

It is hard to estimate what proportion of replacement traffic might use roads in a congested condition. Rail freight often travels overnight and off-peak, and HGV operators replacing rail freight would have strong incentives, where possible, to do the same. Additionally, most of the Strategic Road Network is not congested outside peak times. One plausible assumption is that, for these reasons, virtually none of the additional road freight uses roads in congested condition. Using this assumption, the cost of congestion created from rail freight transferring to road could be £90-160 million per year, depending on the growth in freight traffic. [4]

These costs of congestion from transferring rail freight to road could be used as a maximum ceiling for government capital spending to prevent the congestion from arising. This capital spending could be on additional road construction to increase capacity to accommodate the increase in road freight traffic; or on rail electrification or investing in hydrogen or battery powered freight locomotives, to decarbonise rail freight and prevent having to move freight onto the road in the first place. Based on the present value of the range of the annual congestion costs set out above between 2050 and 2110, the maximum cost of the capital investment programme between 2040 and 2050 to prevent additional congestion after 2050 should be approximately £2-5 billion. [5]

Detailed work will be needed to assess the costs of inaction and the cost effectiveness of potential infrastructure interventions. The Commission has recommended that assessing the costs and benefits of the different options (or combination of options) will require a corridor based approach and extensive cross-modal transport and economic modelling. This should seek to identify where either road or rail freight present the most cost effective zero carbon option, including where roads can take more traffic as well as more technical work to understand the capabilities and costs of hydrogen and battery electric locomotives. This work will also need to assess the impacts on rail and road passenger transport.

The cost of any upgrades to decarbonise rail freight and/or address congestion would need to be covered within the budget for strategic transport, as already set out in the Commission's National Infrastructure Assessment. However, as it is too early to determine a particular course of action, the impact on the fiscal remit is not quantified at this stage. Whichever course of action is chosen, the spending associated with decarbonising rail freight by 2050 is likely to

occur during the 2030s and 2040s.

Impact on bills and public sector resource spending

Recommendation 1

For vans, the Commission believes that businesses will choose to buy battery electric vans rather than internal combustion engine vehicles if they decide that it benefits them, particularly because the lifetime costs of battery electric vans are lower than equivalent diesel vehicles. [6] Because take up is voluntary, no impact on bills is estimated.

It is anticipated that the ban the sale of new diesel HGVs by 2040 will accelerate the uptake of zero emission HGVs. The Commission believes that the long-term decarbonisation target provides ample time for technological development of zero emission vehicles with equivalent or lower lifetime costs of ownership to emerge. The long-term clarity allows operators and manufacturers sufficient time to plan their investments and operations without incurring additional costs. Businesses will choose to buy zero emission models (whether battery electric, hydrogen or another zero emission option) rather than internal combustion engine vehicles during this period if the costs of ownership fall below equivalent diesel vehicles. Take up is anticipated to be market-led and no impact on bills is estimated.

Risk & Uncertainty

Medium confidence

All scenarios of future demand indicate that national demand for freight will continue to grow out to 2050. The rate of growth in freight demand depends on growth in population and economic activity, as well as consumer behavior and preferences.

Freight operators assess investment decisions on the basis of total lifetime costs (including fuel, maintenance and its residual market value when sold). Once the total lifetime costs of zero emission freight vehicles achieve parity with diesel vehicles, uptake of zero emission options could accelerate rapidly.

Both hydrogen and battery electric HGVs are at an advanced stage of development, with a number of manufacturers scheduled to launch heavy battery electric HGVs at the beginning of the 2020s. [7] Take up rates of zero emission HGVs will be influenced by the availability of infrastructure, costs and operational capability. There is particular uncertainty about how quickly zero emission HGVs will fall in cost and increase in operational capability during the 2020s.

The Commission's analysis shows that for battery electric HGVs, the total lifetime cost of vehicles could be lower than diesel HGVs even if the purchase price of the vehicles is substantially higher than diesel equivalents (because of the low cost of electricity). [8] For hydrogen HGVs, there is greater uncertainty about the extent to which the costs of hydrogen and fuel cell vehicles will fall.

There is significant uncertainty about whether vehicle manufacturers will be able to meet a rapid increase in demand for zero emission freight vehicles, given the substantial changes in the manufacturing process required to enable zero emission freight. The Commission has recommended that government provides long-term clarity to manufacturers and the freight industry in order to reduce this risk.

Distributional impacts

Regional	There is no clear trend to the regional impact of these recommendations, though it is likely that urban areas with high levels of congestion and pollution will be the greatest beneficiaries of the Commission's recommendations.
Winners	Households in areas with high levels of congestion and pollution will benefit from higher quality of life.
Losers	Other road users would be negatively affected if rail freight is decarbonised by moving it onto roads with no compensating increase in capacity.
Vulnerable/protected groups	Individuals with respiratory health conditions will benefit more from reduced local pollution.

Indirect effects

The Commission's recommendations on zero emission freight transport aim to support rapid adoption, which will have significant consequences on the energy system – these are inherently uncertain, but are outlined in the Final Report. The Commission's recommendations call on government and industry to map out the possible infrastructure implications of rapid adoption of zero emission HGVs and vans.

Endnotes

1. HM Treasury (23 November 2016), Remit Letter to the National Infrastructure Commission. Accessed at: https://www.gov.uk/government/publications/remit-letter-to-the-national-infrastructure-commission

2. Department for Transport (2018), Road Traffic Estimates: Great Britain 2017

3. Based on the 1.7 billion kilometre (in the Department for Transport's table RAI0403) being multiplied by the equivalent number of Passenger Car Units, totalling 4.3 billion kilometres. 346.2 billion kilometres were travelled on major roads in 2017 and 182.2 billion kilometres were travelled on the Strategic Road Network in 2017 (sourced from the Department for Transport's table TRA0204)

4. Values for cost of additional HGV mileage based on DfT (2014) Mode Shift Benefit Values: Refresh, Table 2 – but excluding benefits of reduced greenhouse gases since HGVs assumed to be zero emission by 2050. The top end of the range also reflects potential growth in freight traffic as estimated by MDS Transmodal for NIC.

5. Discount rate 3.5%, all congestion and capital costs discounted back to 2040 when the capital investment programme would begin. Capital investment programme cost is undiscounted. All values are in real price terms.

6. Based on an electric Nissan e-NV200 (costing c.£20,000), a depot charger (costing £1,600) and a diesel Nissan NV200 (costing c.£15,000) being utilised for 253 working days and travelling 21,500 miles a year.

7. Bloomberg (June 2018), 'Daimler Adds Two Electric Trucks in Race Against Tesla' https://www.bloomberg.com/news/articles/2018-06-06/daimler-adds-two-electric-trucks-in-race-against-tesla-vw

8. Based on a battery electric HGV with a purchase price of £140,000 (the 'expected base price' of a Tesla Semi with a 500 mile range), a depot charger (costing £40,000) and a diesel tractor unit (costing £80,000), both travelling 65,000 miles a year. The calculation uses the stated efficiency of the Tesla Semi (2 kWh per mile) and the average fuel efficiency of an articulated HGV (9mpg – derived from the Department for Transport table ENV0104). On this basis, the costs per mile of a diesel HGV could be £0.52, compared to £0.29 for a battery electric HGV.