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PR23 Charges Review Market Can Bear Analysis - Freight Services

Office of Rail and Road

28th March 2022

FINAL REPORT

CEPA economics matters

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Institute for Transport Studies

Important notice

Contents

EXECUTIVE SUMMARY

The ORR is currently undertaking the 2023 Periodic Review (PR23). This will ultimately determine what Network Rail must deliver during Control Period 7 (CP7, which will cover the period from April 2024 to March 2029), as well as determining the track access charges paid for use of the rail network over this control period. In July 2021 the ORR consulted on its initial proposals for access charging in CP7.

At present, mark-ups are levied on some freight services: those services transporting ESI coal (i.e. that used for electricity generation by the Electricity Supply Industry), iron ore, biomass, and spent nuclear fuel (also known as nuclear waste). These mark-ups are known as freight Infrastructure Cost Charges (ICCs). They are permitted by legislation, as long as they are determined on a market segment's ability to bear that charge on a non-discriminatory basis.

To inform its PR23 charges review, the ORR has commissioned CEPA in conjunction with ITS Leeds to update its previous 'market-can-bear' assessment of GB rail freight. This report sets out our findings and recommendations in terms of appropriate market segmentation and which market segments have an ability to bear an ICC.

The remaining task will be to set ICCs for market segments which can bear this charge. This task sits with the ORR, given that the specific level of ICCs depends on a variety of other factors to be considered as part of PR23. Our analysis is confined to whether market segments can bear an ICC. We summarise below our findings and recommendations from this review.

Market segmentation

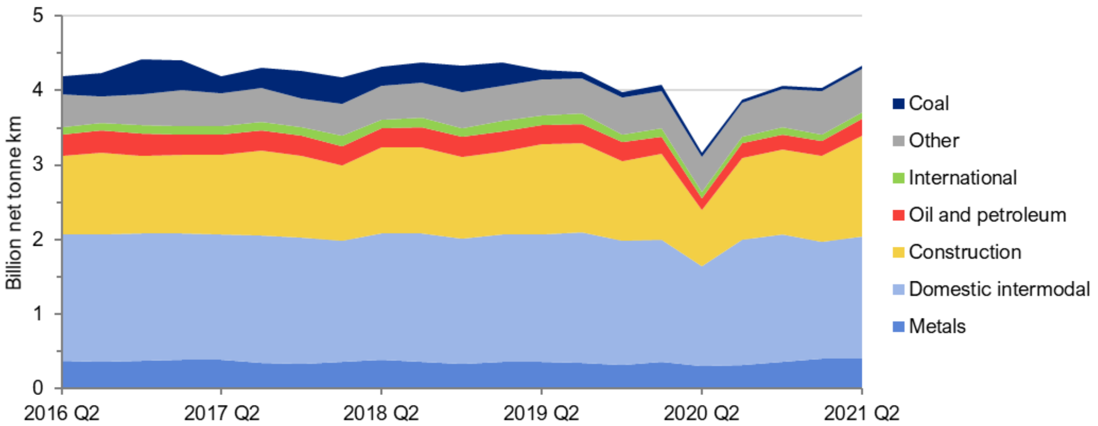
As ICCs must only be charged on those market segments that can bear them, it is important to ensure those market segments are suitably defined. While it is likely that the PR18 segmentation will remain suitable for PR23, the ORR considers it appropriate to assess any changes that may have occurred in each type of freight flow – including for any major new commodity flows, and any potential disaggregation of existing commodity flows.

We considered whether the existing freight market segmentation is appropriate for use in PR23, considering: the overall changes seen in CP6 to date, and a review of the literature on rail freight elasticities. First, we consider key changes that have taken place in CP6 to date, as set out in *Box 1*.

Box 1: Key changes in CP6 to date

Figure 1 shows the volumes of freight flows for various commodities over the last five years. ESI coal, previously the most dominant flow, has seen the most sustained reduction in volumes due to UK efforts to decarbonise electricity generation – making construction and intermodal the largest flows today. This figure also shows the impact of COVID-19, with a 25% reduction in volumes in 2020 Q2 compared to 2019 Q2.

Figure 1: Quarterly rail freight movements in GB (billion net tonne km (net tkm))



Source: CEPA Analysis of Network Rail for ORR Data (2021), Table 1310 – Freight moved by commodity, Amount of freight moved on the rail network (billion net tkm), Great Britain.

Biomass, domestic waste, and iron ore sit within the 'other' and 'metals' categories of this figure – granular data is not available quarterly, but annual data shows that iron ore volumes have remained broadly steady over this period, while there has been meaningful increases in biomass and in domestic waste (from a small base).

We also considered the evidence on elasticities, summarised in *Box 2*, which does not suggest conclusive changes to what we know from PR18.

Box 2: Elasticity literature review

In assessing the ability of a market segment to bear an ICC, direct evidence of elasticities of demand for rail freight services is highly relevant. This can inform our understanding of the extent to which users will reduce rail freight demand in response to an increase in access charge. In summary, we find that freight demand elasticities are likely to be influenced by:

- The commodity being transported. In general, demand from bulk commodities tends to be less elastic than demand from other commodities. Furthermore, demand from commodities for which rail has a higher transport market share also tend to be less elastic.
- The distance of the flow. Specifically, there is some evidence that longer-distance flows tend to be less elastic than shorter flows, though the available evidence on this relationship is limited.

Overall, we considered that the existing freight market segmentation remains appropriate – though we identified two areas for further consideration: the existing split between ESI coal and Other Coal; and the potential to further segment the intermodal market by length of flow. We prioritised the following market segments to consider in more detail in this study:

- The four segments for which an ICC is currently levied – coal, biomass, iron ore, and nuclear waste.
- The largest flows, which are shown in Table 1 to be intermodal and aggregates.
- Domestic waste, a market segment that ORR has not previously considered in detail, but which has shown significant growth (from a small base) since the freight market was last reviewed in PR18.

Market-can-bear assessment

We carried out a forward-looking assessment of whether each segment can bear an ICC.

Many of the current segments were assessed at PR18 (and PR13). The ORR considers that a proportionate approach at this time is to consider the extent to which there have been changes since PR18 that may affect ability to bear, and the appropriateness of levying an ICC. To do this, we have considered a range of evidence. Our findings are summarised in the table below.

Table 1: Summary of our findings and recommendations

		Demand for the commodity and for rail freight	Competition from other modes and the impact of any existing ICC	Recommendation for CP7
Coal	ESI coal	Marked reduction due to a managed decline of coal generation, forecast to reach zero by Year 1 of CP7.	Road may become more competitive as volumes continue to fall.	Remove the ESI coal ICC (subject to review later in PR23).
	Other coal	Steady but low demand for the past ten years, is now at a similar in magnitude to ESI coal in recent years.	Road is reasonably competitive with rail at these low volumes.	Do not introduce an ICC. Monitor the market in greater detail to inform PR28.
Biomass		Marked increase in demand over recent years, expected to plateau in CP7.	Rail is competitive and biomass has signalled this through recent rail facility investments. Rail is cost effective.	Retain an ICC.

	Demand for the commodity and for rail freight	Competition from other modes and the impact of any existing ICC	Recommendation for CP7
Iron ore	Stable rail demand over recent years.	Low competition from other modes. Rail is more cost effective than road.	Retain an ICC.
Nuclear waste	Reduced demand due to temporary reduction in nuclear capacity and generation.	High affordability and competitiveness of rail in transporting nuclear waste.	Retain an ICC.
Intermodal	Steady volumes in recent years (aside from a COVID-19 dip). Forecast high future growth.	Strong competition from road. Existence of government support scheme to encourage intermodal on rail.	Do not introduce an ICC. Undertake a study to understand longer vs shorter flows.
Aggregates	Steady volumes in recent years (aside from a COVID-19 dip).	Strong competition from road.	Do not introduce an ICC.
Domestic waste	Large increase in volume, albeit from a low base.	Road is dominant. It is unclear how this market is evolving, and the role rail may play in the growth of 'waste to energy'.	Do not introduce an ICC. Monitor the market in greater detail to inform PR28.

In summary, our key recommendations are as follows:

- We recommend maintaining the same market segments for PR23 as were used at PR18.
- We consider that the current set of ICCs should be maintained, other than for ESI Coal, which we recommend removing (pending a further review of forecast volumes for this commodity later in PR23)
- We do not recommend levying an ICC on any further commodities in CP7. However, we recommend monitoring how the 'other coal' and domestic waste segments develop over the course of CP7.

1. INTRODUCTION

1.1. BACKGROUND

The ORR is currently undertaking the 2023 Periodic Review (PR23). This will ultimately determine what Network Rail must deliver during Control Period 7 (CP7, which will cover the period from April 2024 to March 2029), as well as determining the track access charges paid for use of the rail network over this control period. In July 2021 the ORR consulted on its initial proposals for access charging in CP7.[1]

Current legislation **requires** that charges for the minimum access package must be set to reflect "*the cost that is directly incurred [by Network Rail] as a result of operating the train service*".[2] Network Rail sets its variable charges in accordance with this.

The legislation then **permits** additional charges (mark-ups) determined on a market segment's ability to bear that charge on a non-discriminatory basis. Important requirements in the legislation for setting mark-ups include the following in Schedule 3:

- A mark-up is permitted to obtain full cost recovery, and must be efficient, transparent, and non-discriminatory. (Paragraph 2(1))
- A mark-up must not exclude from the infrastructure any segments that can pay the minimum access package plus "a rate of return which the market can bear". (Paragraph 2(3))
- In evaluating the relevance of a mark-up for specific market segments, the ORR must ensure the infrastructure manager considers **at least** the pairs listed below (Paragraphs 2(5) and 2(10)):
    - Passenger versus freight services.
    - Trains carrying dangerous goods versus other freight trains.
    - Domestic versus international services.
    - Combined transport versus direct trains.
    - Urban or regional versus interurban passenger services.
    - Block trains versus single wagon load trains.
    - Regular versus occasional train services.
- Further market segments may be considered according to commodity or passengers transported (Paragraph 2(7)).

At present, mark-ups are levied on some freight services: those services transporting ESI coal (i.e. that used for electricity generation by the Electricity Supply Industry), iron ore, biomass, and spent nuclear fuel. These mark-ups are known as freight Infrastructure Cost Charges (ICCs).[3]

As part of PR23, the ORR will review freight market segmentation and the suitability of ICCs for each relevant market segment, for the duration of the next control period (2024-2029).

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[1] ORR (2021), PR23 – Review of Network Rail's access charges, Technical Consultation, Initial Proposals, July. Available at: https://www.orr.gov.uk/sites/default/files/2021-07/pr23-access-charges-review-initial-consultation-july-2021.pdf

[2] The Railways (Access, Management and Licensing of Railway Undertakings) Regulations 2016, https://www.legislation.gov.uk/uksi/2016/645/made. See Schedule 3, paragraph 1(4) ('Principles of access charging'). The minimum access package is those services set out in Schedule 2 of the 2016 Regulations, essentially the services necessary to access the infrastructure

[3] For billing purposes, this is known as the freight-specific charge, or FSC.

1.2. PR18 AND CURRENT FREIGHT ICCS

As part of the 2018 Periodic Review (PR18), the ORR commissioned CEPA to review changes in freight markets that had occurred since the 2013 Periodic Review (PR13) and assess the impact of those changes on ability to bear freight ICCs.[4]

This study was largely top down and qualitative in nature but informed by evidence of market changes and input from rail and wider stakeholders. The most significant change compared with PR13 was to biomass. We concluded that existing ICCs remained appropriate for CP6. We did not recommend introducing ICCs for other market segments:

- **Biomass**. The biomass market had developed significantly since PR13 and there were good arguments in favour of the current market participants' ability to bear the ICC. In particular we found inelasticity of demand for rail from the new plants (especially given considerable investment in infrastructure by their operators) and considered that they would likely be profitable given government subsidies. While we did not have evidence on their operating costs – and were more cautious on ability to bear of potential new entrants – on balance we recommended the phased introduction of the ICC over CP6. ORR agreed with our analysis and a phased charge was implemented.
- **Coal.** The market appeared able to bear the ICC, with movement of coal inelastic and the cost of the ICC unlikely to impact coal's commercial position. We also highlighted that removing the charge would appear inconsistent with Government policy towards the environment.
- **Iron ore.** The ICC remained appropriate, with low levels of competition on the main flow and as the charge was marginal in the context of overall steel production costs.
- **Nuclear waste** was inelastic and the impact of the ICC appeared to be minimal.
- **Intermodal routes.** There was some indication that certain routes might have the ability to bear a charge
- but there was insufficient evidence to firmly recommend that one be levied. It was also considered that an ICC on intermodal would conflict with the Government's MSRS scheme encouraging rail freight.
- **Aggregates/construction.** We found that movement by road was cost effective which suggested that rail freight demand was elastic, and so the ability to bear a charge was low.

1.3. SCOPE OF THIS STUDY

To inform its PR23 charges review, the ORR has commissioned CEPA in conjunction with ITS Leeds to update its previous 'market-can-bear' assessment of GB rail freight.[5] In broad terms, this assessment has two components:

- **A market segmentation exercise**. As ICCs must only be charged on those market segments that can bear them, it is important to ensure those market segments are suitably defined. While it is likely that the PR18 segmentation will remain suitable for PR23, the ORR considers it appropriate to assess any changes that may have occurred in each type of freight flow – including for any major new commodity flows, and any potential disaggregation of existing commodity flows.
- **A forward-looking assessment of whether each segment can bear an ICC**. Many of the current segments were assessed at PR18 (and PR13). The ORR considers that a proportionate approach at this time is to consider the extent to which there have been changes since PR18 that may affect ability to bear, and the appropriateness of levying an ICC. To do this, we have considered: the latest available evidence on

[4] PR18 structure of charges review - Market can bear analysis - Freight services. Report by CEPA for ORR (September 2017). Available at: https://www.orr.gov.uk/media/14195

[5] The market-can-bear test is equally applicable to passenger and freight markets. The ORR has separately commissioned a review on the passenger side, focusing on open access operators.

freight demand elasticities; qualitative arguments made by stakeholders individually and at a workshop held as part of this project; government policy implications; and other relevant factors affecting the competitiveness of rail as a freight transport mode.

The remaining task will be to set ICCs for market segments which can bear this charge. This task sits with the ORR, given that the specific level of ICCs depends on a variety of other factors to be considered as part of PR23. Our analysis is confined to whether market segments can bear an ICC.

1.4. Rest of this document

The remainder of this document is structured as follows:

- Section 2: Approach to PR23 market-can-bear analysis. This sets out our approach, key changes in CP6 to date, key findings from the available literature on freight demand elasticities, and the implications these findings have for PR23.
- Section 3: Assessment of individual market segments. This sets out our assessment of each of the market segments that we have considered in detail as part of this study: coal, biomass, iron ore, nuclear waste, intermodal, aggregates, and domestic waste.
- Section 4: Summary of recommendations. In this section we provide a brief overview of the recommendations made in relation to each of the commodities examined in Section 3.

2. APPROACH TO PR23 MARKET CAN BEAR REVIEW

In this section, we:

- Summarise our overarching market-can-bear approach for freight.
- Highlight key changes that have occurred since the freight market was last reviewed as part of PR18, including key considerations affecting all market segments.
- A brief review of elasticity analysis in the literature, alternative sources of evidence on freight demand elasticities to consider alongside the MDST 2006 work that underpins the existing ICCs.
- A summary of the key implications that our analysis in this section has for our market-can-bear assessment.

2.1. Overarching approach

Our review began with a consideration of whether any changes to the existing freight market segmentation were necessary. In considering this question, we have maintained the broad approach of defining segments according to commodities carried. The ORR emphasised the value of this approach in its July 2021 consultation:[6]

> *"We intend to commence work on updating the market-can-bear test for freight operators later this year, in parallel with our market-can-bear test for open access, to determine which freight services should be liable to pay ICCs. We expect to retain the same approach to market segmentation that has been used in previous reviews i.e. based on commodities carried. This approach is now well-established and understood by the freight industry; remains practicable to implement; and is likely to reflect differences in underlying demand for rail freight, which is the basis for an assessment of ability to bear mark-ups."*

However, within the framework of a commodity-based segmentation, we have reconsidered whether there is a case for amending the boundaries between some existing segments and/or further segmenting segments according to sub-flows of traffic, for instance due to differences in the level of competition they face from alternative transport modes.

We then prioritised market segments to consider in more detail, using the following criteria.

- Commodities with a large or rapidly increasing volume of traffic on the network.
- Commodities that currently pay an ICC.
- Commodities experiencing significant change since PR18.

For the market segments which we have considered in more detail, we then assessed the ability to bear (in the case of market segments that were assessed in PR18, we focused on assessing whether and how this assessment has *changed* since then).

In principle, the ability of a market segment to bear an ICC is driven by the price elasticity of demand for rail freight – how responsive demand is to a change in the price (e.g. by introducing an ICC). Within this there are two key ways in which ICCs might affect rail freight demand:

- Traffic may switch to other modes of transport, e.g. road, if the relative price of rail freight becomes too high (it does not necessarily need to be higher, as there may be other considerations affecting the choice) – or it may change its origin/destination (resulting in a change to tkm) if a price rise encourages it to seek changes in its operation.

[6] See paragraph 3.30 of ORR's July 2021 consultation.

- The end demand for a commodity may be affected if the increased price of transportation has a material impact on the overall cost.

While our primary focus has been on ability to bear, we have also had regard to other factors which may be relevant when considering the appropriateness of an ICC, for example considering wider government policy.

Our analysis has been informed by a range of evidence, including:

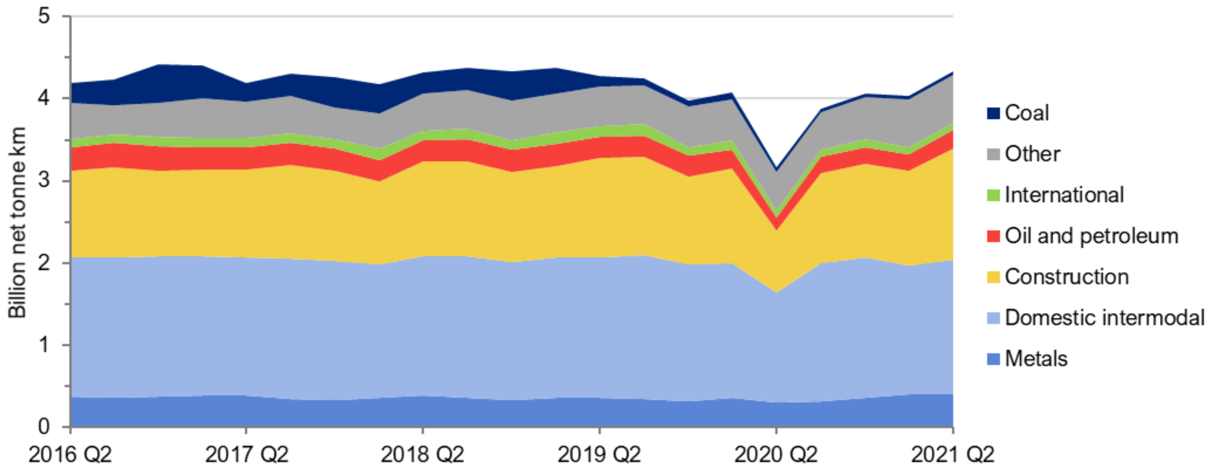
- Analysis of data provided by ORR and Network Rail on trends in rail freight volumes, alongside publicly available data.
- A literature review of the available evidence on freight demand elasticities.
- A qualitative assessment of changes in specific market segments, and key drivers of rail competitiveness.

To supplement this desk-based analysis, we also held discussions with various stakeholders in the freight industry. Overall, we have taken a proportionate approach, with a focus on considering the impact of material changes that have taken place since the last market-can-bear review in PR18.

2.2. Key changes in CP6 to date

In our analysis, we present available data as appropriate, e.g. to show long-term trends, but our focus is on considering how the situations have changed since the last market-can-bear review, which was at PR18 (2017-18). Figure 2.1 shows the volumes of freight flows for various commodities over the last five years. ESI coal, previously the most dominant flow, has seen the most sustained reduction in volumes due to UK efforts to decarbonise electricity generation – making construction and intermodal the largest flows today. This figure also shows the impact of COVID-19, with a 25% reduction in volumes in 2020 Q2 compared to 2019 Q2.

Figure 2.1: Quarterly rail freight movements in GB (billion net tonne km (net tkm))[7]



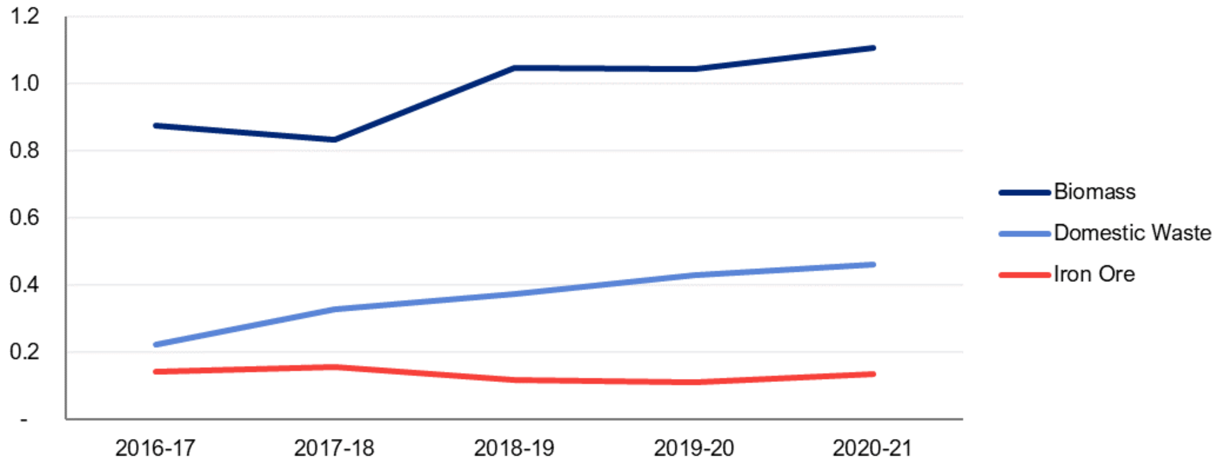
Source: CEPA Analysis of Network Rail for ORR Data (2021), Table 1310 – Freight moved by commodity, Amount of freight moved on the rail network (billion net tkm), Great Britain.

The annual data is reported to a level of granularity that allows us to break out three important sub-segments not shown in Figure 2.1: biomass, iron ore, and domestic waste. The last five years of data for these commodities is

[7] Rail freight statistics are often reported as freight lifted or as freight moved. Freight **lifted** is measured in tonnes, representing the mass of goods carried on the rail network, excluding the weight of the locomotives and wagon. Freight **moved** is measured in tkm (or another unit accounting for both mass and distance), representing the mass of freight lifted as well as the distance that freight has been moved. See, https://dataportal.orr.gov.uk/media/1233/freight-quality-report.pdf p.4 and p.6. We refer to freight more generally as being **transported**.

shown in Figure 2.2 below. This data demonstrates that biomass and domestic waste volumes have both increased over this period.

Figure 2.2: Rail freight movements in GB by financial year (billion net tkm)



Source: CEPA Analysis of data provided by the ORR

2.3. Elasticity analysis

In assessing the ability of a market segment to bear an ICC, direct evidence of elasticities of demand for rail freight services is highly relevant. This can inform our understanding of the extent to which users will reduce rail freight demand in response to an increase in access charges – whether due to switching to another mode of transport (typically road in the UK) or due to reducing overall demand for that relevant commodity.

In previous periodic reviews, the ORR has drawn on estimates of commodity-specific demand elasticities produced by MDST using their GB Freight Model. We have not had access to the original analysis undertaken in 2006, nor to the various assumptions it uses.

To inform its PR23 charges review, ORR has commissioned MDST to update some of its estimated freight demand elasticities to reflect more recent assumptions about rail freight demand and the relative costs of different transportation modes. The full results from this work are set out in a separate study.

To complement MDST's work, and provide a cross-check against its updated results, we asked ITS Leeds to carry out a review of the relevant academic literature on rail freight elasticities. This review focuses on standard econometric methods of price elasticity analysis. It considered 13 academic papers which drew on the experience of European countries.

Overall, the evidence that ITS identified was mixed, suggesting that variations in approach based on year, data (spatial scope, scale and commodity categorisation) and modelling technique can lead to different, sometimes contradictory results, but we are able to have greater confidence in elasticity estimates when multiple studies point in the same direction.

We present a full summary of the review in Appendix A. In summary, we find that freight demand elasticities are likely to be influenced by:

- The commodity being transported. In general, demand from bulk commodities tends to be less elastic than demand from less bulkier commodities. Furthermore, demand from commodities for which rail has a higher transport market share also tend to be less elastic.
- The distance of the flow. Specifically, there is some evidence that longer-distance flows are generally less elastic than shorter flows, though the available evidence on this relationship was more limited.

In general, this focused literature review and the resulting implications (particularly in respect of commodities transported) offer some support to MDST's previous findings, with the elasticity estimates falling within the ranges identified in this review. We note that MDST's updated analysis will also directly consider how demand elasticities may vary according to length of flow, for specific commodities.

2.4. Key implications

Overall, in light of the analysis presented above, we consider that the existing freight market segmentation remains appropriate – though we have identified two areas for further consideration: the existing split between ESI coal and Other Coal; and the potential to further segment the intermodal market by length of flow. We discuss these points in more detail in the relevant sections (Section 3.1 and 3.5 respectively)

We have also prioritised the following market segments, using the criteria set out in Section 2.1, to consider in more detail:

- The four segments for which an ICC is currently levied – **coal**, **biomass**, **iron ore**, and **nuclear waste**.
- The largest flows, which are shown in Figure 2.1 to be **intermodal** and **aggregates**.
- **Domestic waste**, a market segment that ORR has not previously considered in detail, but which has shown significant growth since the freight market was last reviewed in PR18 (doubling from 0.23 to 0.46 billion net tkm between 2016-17 and 2020-21).

We assess each of these market segments in turn in Section 3. We have not considered any other freight market segments in detail, as part of this review.

3. ASSESSMENT OF INDIVIDUAL MARKET SEGMENTS

In this section we carry out a high-level market-can-bear assessment of the specific commodities that we have identified in Section 2 warrant further consideration: coal; biomass; iron ore; nuclear waste; intermodal; aggregates; and domestic waste.

In the sub-sections that follow we discuss each segment and the analysis that underpins our recommendations, which we summarise in Section 4.

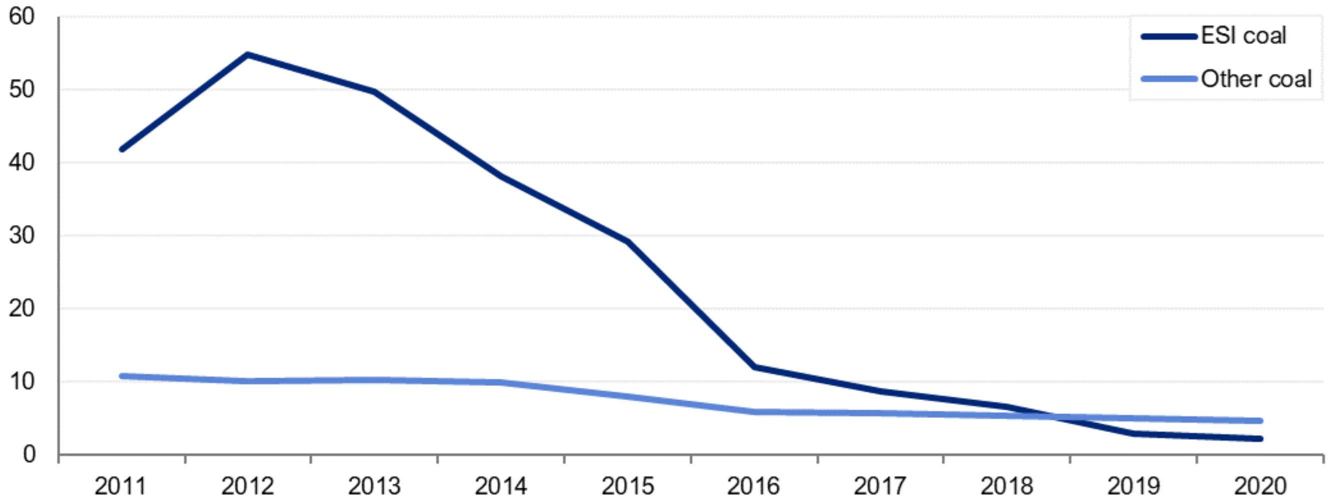
3.1. Coal

3.1.1. Context

Demand for coal

Driven by the reduction in coal used for electricity generation, demand for coal fell significantly from 55m tonnes in 2012, to 9m tonnes in 2017 (prior to the start of CP6) and to 2m tonnes in 2020 – as shown by the darker line in Figure 3.1. Coal has been displaced from the UK energy mix by other methods of electricity generation. In 2020, it had a 3% share of energy demand, compared to 5% in 2017 and a 16% share in 2011.[8] In 2017, the UK government set a deadline to phase out ESI coal by 2025 and recently revised this commitment to 2024.[9]

Figure 3.1: Demand for ESI coal 2011-20 (m tonnes)



Source: CEPA analysis of BEIS (2021), DUKES 2021, Table 2.4: Supply and consumption of coal. Available at: https://www.gov.uk/government/statistics/digest-of-uk-energy-statistics-dukes-2021

In the same timeframe, demand for 'other coal'[10] has also fallen, but less dramatically. The net effect is that other coal now accounts for a larger amount of coal usage than ESI coal, as shown by the lighter line in Figure 3.1. Other coal is mainly used in steel production: in 2020, 35% was used in coke manufacture and 23% was used in blast furnaces, both parts of the steel production process. Other coal is also used for mineral products manufacture (12%

[8] BEIS (2021), DUKES 2021, Table 1.1 and Aggregate Energy Balance 2011. Available at: https://www.gov.uk/government/statistics/digest-of-uk-energy-statistics-dukes-2021

[9] BEIS (2021), Press release: End to coal power brought forward to October 2024. Available at: https://www.gov.uk/government/news/end-to-coal-power-brought-forward-to-october-2024

[10] Other uses are explained at: World Coal Association, Other uses of coal. https://www.worldcoal.org/coal-facts/other-uses-of-coal/

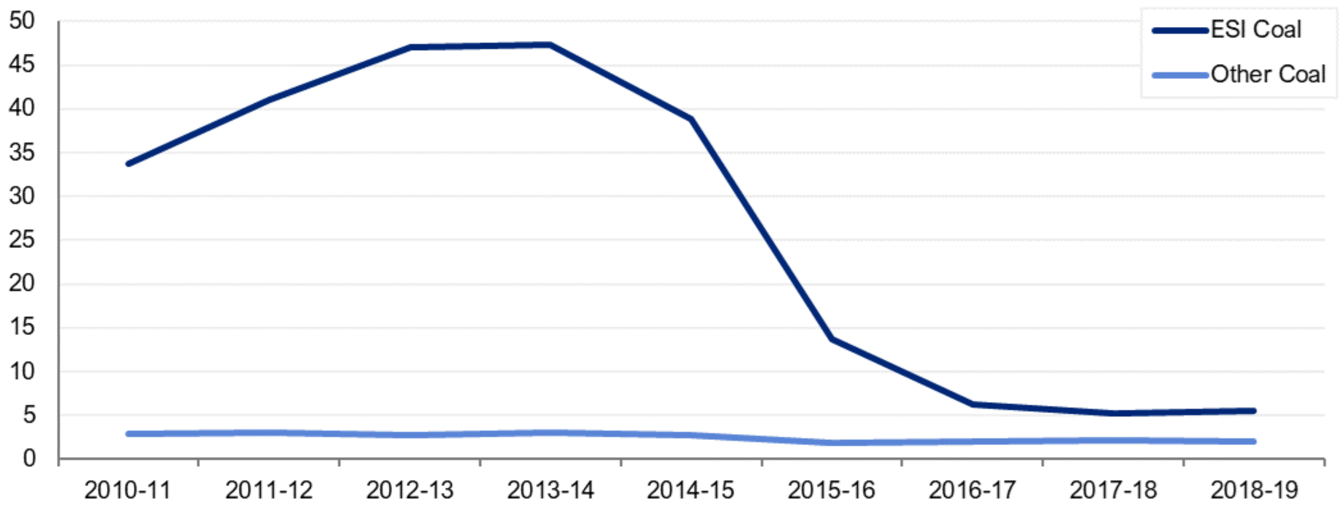
in 2020) and domestic use (10% in 2020), such as for domestic heating.[11] These other transformations saw a 65% reduction in demand between 2011 and 2020 (13% since 2017), predominantly due to a fall in steel production.[12] Final consumption demand also fell in this time period by 30% (23% since 2017).

The UK government is moving away from coal use in other transformations. For example, it launched a call for evidence on a Clean Steel Fund in 2019 (see Section 3.3).[13] This £250m fund is intended to help steel manufacturers transition to lower carbon production. We therefore expect demand for other transformations to decline further in future.

Demand for rail freight transportation

The lower demand for ESI coal is reflected in the volumes lifted by freight, with coal lifted falling from 47m tonnes at its peak in 2012-13 to just 6m tonnes in 2018-19 (from 41% to 6% of total rail freight lifted) – see Figure 3.2.

Figure 3.2: Other and ESI Coal lifted 2011-12 – 2018-19 (m tonnes)



Source: CEPA analysis of Network Rail (2020), Rail freight forecasts, scenarios for 2033/34 & 2034/44, Table 15: Rail freight tonnes by sector from 2004/05 to 2018/19, p. 40. Available at: https://www.networkrail.co.uk/wp-content/uploads/2020/08/Rail-freight-forecasts-Scenarios-for-2033-34-and-2043-44.pdf

In line with UK plans to phase out ESI coal, Network Rail has forecast that there will be no ESI coal movements by 2023/24.[14] Drax (a major energy producer) has converted four of its six coal units into biomass units (see Section 3.2), and it ceased operation of the remaining two in March 2021.

The lifting of non-ESI coal by rail also reduced in recent years, from 3m tonnes in 2011-12 to 2m tonnes in 2018-19. Network Rail forecasts 3m tonnes to be lifted in 2023-24 (an increase of 45%) and 2.6m tonnes in 2033-34 and 2043-44.

[11] BEIS (2021), DUKES 2021, Table 2.1. Available at: https://www.gov.uk/government/statistics/digest-of-uk-energy-statistics-dukes-2021

[12] Make UK (2021), UK Steel: Key Statistics Guide April 2021, p. 3. Available at https://www.makeuk.org/insights/publications/uk-steel-key-statistics-guide-2021

[13] BEIS (2019), Clean Steel Fund: Call for evidence. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/943254/clean-steel-fund-call-for-evidence.pdf

[14] Network Rail (2020), Rail freight forecasts, scenarios for 2033/34 & 2034/44, Table 15: Rail freight TONNES by sector from 2004/05 to 2018/19, p. 40. Available at: https://www.networkrail.co.uk/wp-content/uploads/2020/08/Rail-freight-forecasts-Scenarios-for-2033-34-and-2043-44.pdf

3.1.2. Analysis

Competition from other modes

Total coal moved by road fell 67% between 2012 and 2020 – compared to the 96% reduction in coal moved by rail over the same period. In 2012, 13% of coal movements in the UK were by road, increasing to around 40% by 2020-21 – 0.3 bn net tkm by road, 0.2bn net tkm by road.

In our PR18 review, we concluded that the market of coal transportation is likely to remain relatively inelastic over longer flows, but that elasticity would increase as the total tkm of coal on rail falls – as the fixed costs of maintaining coal-handling facilities will be spread over fewer movements. With ongoing reduction in coal movement – and the prediction for this to fall to nothing by the early part of CP7 – elasticity might be expected to increase. This suggests that road may become a more competitive alternative to rail, at least in the short term.

Impact of the ICC on ESI Coal

As shown in Section 3.1.1, the volumes of ESI coal transported by rail have continued to fall. But, as in the PR18 assessment, the decline pre-dates the implementation of the ICC – which remains a small proportion of overall costs. This was reinforced in 2021, when coal was occasionally commissioned[15] after gas prices saw a substantial rise.[16] It also reflects a decline in overall demand for ESI coal (as opposed to it having switched to being transported by road). We therefore consider that, on balance, the decline in ESI coal transported by rail is most likely to have been driven by wider Government policy.

We recognise that the volumes of ESI coal are becoming so low that it is appropriate to also consider whether it is proportionate in administrative terms to continue to levy the ICC in CP7, alongside considering whether the market can bear it.[17] The revenues raised from the ICC across CP7 might not justify calculating and levying an ICC for the duration of the next control period. But we recognise that these forecasts are not definite. As we saw in 2021, coal use in electricity generation is not yet fully decommissioned. If coal use looks set to continue beyond the first year of CP7 in any meaningful volume (e.g. if there is a change in government policy), it would be appropriate to retain the ICC for CP7.

Wider government policy

The government plans to phase out ESI coal by 2024 and to reduce the use of coal for other purposes. There are environmental pressures on steel production, designed to encourage the reduction of use of coal in the steel making process. Steel can be produced in two ways: using raw material in blast furnaces powered by coal, or in Electrical Arc Furnaces (EAF), using electricity to produce recycled steel – EAF produces less carbon and so may become more common in future.[18] Currently 29% of global steel production uses EAF,[19] and the UK government has highlighted it as a pathway to low-carbon steel production.[20] This could lead to further reductions in 'other coal'

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[15] This has been reflected in the movements of coal on rail: "*Coal volumes saw the biggest percentage increase compared with a year ago (2020-21 Q2), rising by 60.0%. This can be explained by the resumption in the use of coal in electricity generation at West Burton and Ratcliffe power stations. Reasons behind this include low levels of wind generation and high gas prices.*" https://dataportal.orr.gov.uk/media/2040/freight-rail-usage-and-performance-2021-22-q2.pdf

[16] Reuters (2021), European gas price surge prompts switch to coal. Available at: https://www.reuters.com/business/energy/european-gas-price-surge-prompts-switch-coal-2021-10-12/

[17] We recognise that the proportionality argument for removing an ICC is slightly different to that for introducing a new ICC – there are data processes, payment systems etc already in place, slightly reducing the administrative burden vs implementing a new ICC on a segment not already subjected to one.

[18] For example, British Steel is considering moving to EAF: British Steel, Sustainability. Available at: https://britishsteel.co.uk/who-we-are/sustainability/

[19] World Coal Association, Coal and Steel. Available at: https://www.worldcoal.org/coal-facts/coal-steel/

[20] BEIS (2019), Clean Steel Fund: Call for evidence. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/943254/clean-steel-fund-call-for-evidence.pdf

demand, but it is unclear whether this will meaningfully impact CP7 – the current 2030 target for the steel industry requires a reduction in CO_2 emissions, with an aim for net-zero by 2035.[21] But it is unclear to what extent this requires reducing coal use.

Reconsidering the division between the sub-segments

We have considered the extent to which it might be appropriate to re-consider the division of the coal segment between ESI coal and other coal. Ultimately, we consider this would not be proportionate at this stage, not least because we are recommending the removal of the ICC on ESI coal (conditional on no indications that use of coal for electricity generation is likely to continue beyond the current government target of 2024). Two further considerations are discussed briefly below:

Sub-segments within 'other coal'

Previous analysis of this market segment by MDST indicated that coal transported to steelworks is likely to be more captive to rail than coal to other industrial plants, such as cement works (which has smaller volumes and stronger competition from road).

But further segmenting this already small market would risk a disproportionate approach in this review. Firstly, it would create an additional billing requirement for Network Rail and its customers for a small amount of revenue. Furthermore, we note that the main end use of iron ore transported by rail is for steel manufacturing, and iron ore is currently charged an ICC. If an ICC were also introduced for coal flows predominantly used by this industry, then the ORR would need to carefully consider the combined impact of the two ICCs on the steel industry (and, by extension, the demand for these inputs).

Redrawing the segments within coal

We have also considered whether it would be appropriate to redraw the sub-categories within coal (e.g. to include steel uses alongside ESI coal, leaving 'other coal' as the second category). If this were ORR's chosen option, it might justify retaining the ESI coal ICC as it would be levied on a larger volume of rail movements in CP7. But the same concerns around the impact of two ICCs affecting the steel industry (via coal and iron ore) exist for this option as in the discussion above.

3.1.3. Summary of implications

ESI Coal

While demand for rail from the ESI coal market may be becoming somewhat more elastic over time, it is likely to remain relatively inelastic for longer flows. The changing relative price of gas and coal in 2021 – and the temporary increase in coal use that resulted – also indicates that the ICC does not appear to be having a meaningful impact on the viability of coal. We therefore conclude that this market segment appears to continue to be able to bear a charge.

Nonetheless, we consider that there are proportionality grounds for removing it in CP7. This is based on the expectation that use of coal in electricity generation will reach zero in 2024 – the first year of CP7. Policy commitment in this area has been strong.

The ORR should monitor rail volumes and government policy in this area – if coal usage experiences a resurgence by 2023, or if it appears likely to persist past the first year of CP7, we consider the 'proportionality' justification for removing the ICC no longer applies and the ICC should be retained.

[21] BEIS (2021) Industrial Decarbonisation Strategy. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/970229/Industrial_Decarbonisation_Strategy_March_2021.pdf

Other Coal

Other coal has not previously been a market segment of specific interest when considering ICCs but doing so is appropriate in the PR23 review as it now represents a larger proportion of coal movements than has previously been the case.

For the steel component of the 'other coal' usage, our assessment of the iron ore flows (see Section 3.3) indicates that the industry can bear an ICC on iron ore. Considered in isolation we might conclude that there are grounds to consider an ICC for other coal, but caution is advised particularly as this remains a relatively small flow. As such, at this point in time we do not recommend the imposition of an ICC on other coal, but would recommend continuing to monitor the market.

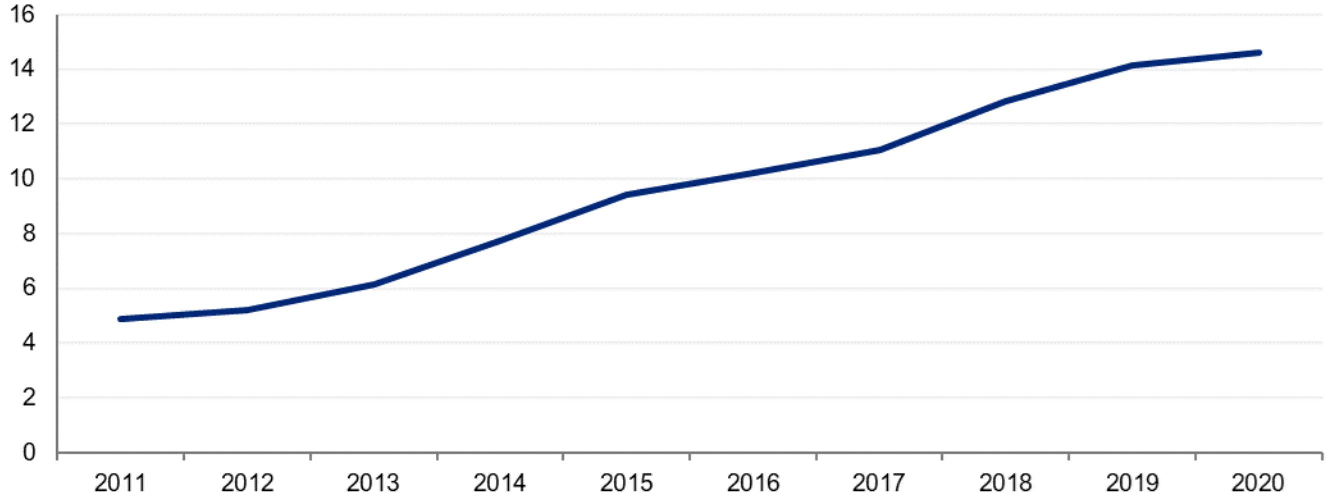
3.2. Biomass

3.2.1. Context

Demand for biomass

Demand for biomass has increased over recent years, from 11.0 million tonnes of oil equivalent (mtoe) in 2017 to 14.6 mtoe in 2020. Biomass now has a primary energy demand share of 9%, compared to 3% for coal.

Figure 3.3: Demand for biomass 2011-20 (mtoe)



Source: CEPA analysis of BEIS (2021), DUKES 2021, Tables 6.1-6.10 Renewable sources of energy commodity balance 2011-20. Available at: https://www.gov.uk/government/statistics/digest-of-uk-energy-statistics-dukes-2021

The consistent growth seen over the last decade is primarily explained by Drax's conversion of four plants to biomass. These conversions are sustained by UK subsidies for renewable energy, specifically Renewables Obligation Certificates and Contract for Difference. In 2019, these subsidies made up 19% of Drax's revenues.[22] This dependence on subsidy creates some uncertainty about the future of the biomass market. The current subsidy scheme is set to end in 2027, with no current plans for a replacement scheme. There is also pressure to restrict biomass subsidies resulting from concerns about its sustainability. For example, Drax was recently dropped from an index of green energy firms.[23] On balance it seems likely that the biomass energy industry will likely not continue current growth, but rather plateau over the coming years.

The recent increases in electricity prices resulting from higher gas prices are likely to have benefitted the biomass industry, which is able to achieve a higher wholesale price for a less severe increase in input costs than e.g. gas generation has seen – although we caution that it is unclear whether such highs will persevere to and throughout CP7.

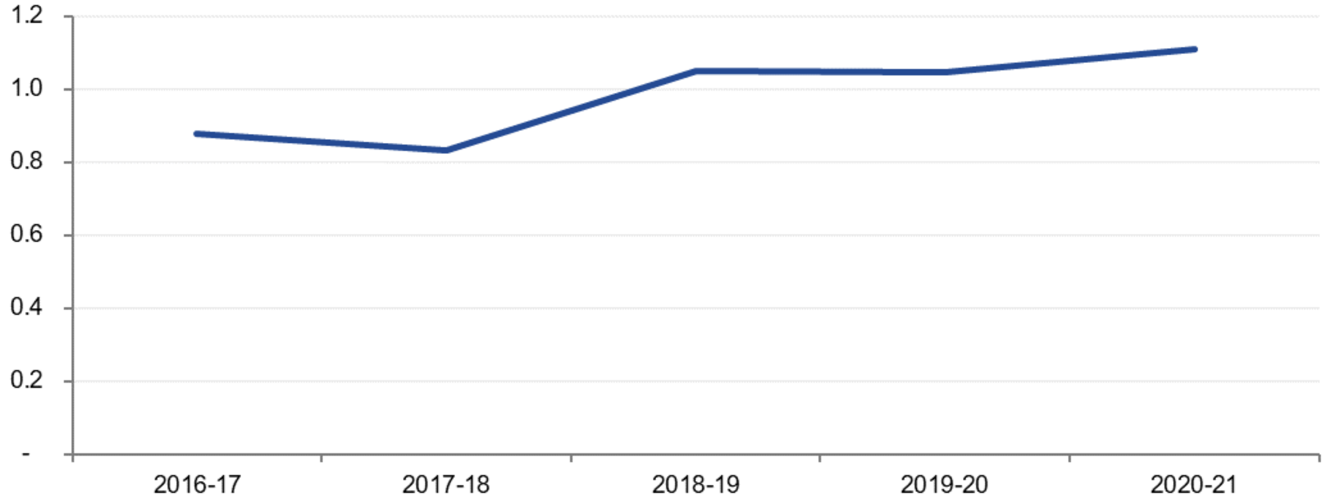
[22] Financial Times (2019), Clock ticks for Drax to find a new financial model. Available at: https://www.ft.com/content/0ea774da-1680-11ea-9ee4-11f260415385

[23] The Guardian (2021), Drax dropped from index of green energy firms amid biomass doubts. Available at: https://www.theguardian.com/business/2021/oct/19/drax-dropped-from-index-of-green-energy-firms-amid-biomass-doubts

Demand for rail freight transportation

The current increased demand for biomass is reflected in the rail freight movement of biomass. Biomass movements increased by 33% between 2017-18 and 2020-21 while total freight movements decreased.

Figure 3.4: Rail freight movements of biomass, in GB by financial year (billion net tkm)



Source: CEPA analysis of data provided by the ORR

Biomass represented a 5% share of total freight movements in 2016-17, and a 7% share of total movements in 2020-21. Since 2018-19 more biomass has been moved annually than ESI coal, and since 2019-20 more biomass has been moved annually than all coal (ESI and other coal).

Despite this increase, and in line with the market situation outlined above, Network Rail does not forecast ongoing increased growth in biomass movements. It suggests an increase of biomass tonnes moved between 2016-17 and 2023-24, from 6.5m tonnes to 10.8m tonnes with a levelling or decrease thereafter. It provides a forecast range of 5-10m tonnes moved for both 2033-34 and 2043-44, citing a lack of future plans to convert more plants to biomass as its rationale.

3.2.2. Analysis

Competition from other modes

There are two biomass plants in the UK that use rail freight services. These are Drax's plant in Selby, and the Lynemouth Power Station, north of Newcastle.[24] Most biomass used by these plants is sourced from North America. The supply chain of biomass from North America to the UK involves transportation by road in North America, then by ship to the UK, and by rail in the UK. Biomass is shipped to ports in Liverpool, Immingham, Tyne and Hull. It is then transported by rail to the plants. These rail flows are short-to-medium in length, between 20 and 100 miles. Smaller biomass plants exist within the UK but tend to source their biomass locally, using road transport.

In 2020, Drax extended two contracts for transportation of biomass between these ports and its power stations, to run until 2025.[25] In 2021 Network Rail completed bridge improvements on a line to Drax's power station, increasing the reliability of rail freight.[26] These developments indicate a commitment, at least in the near future, to rail

[24] CEPA (2017), PR18 Structure of charges review - Market can bear analysis - Freight services. Available at: https://www.orr.gov.uk/media/14195

[25] https://www.drax.com/press_release/gb-railfreight-and-drax-extend-rail-contract-to-transport-biomass-until-2025/

[26] https://www.networkrailmediacentre.co.uk/news/network-rail-improves-reliability-of-freight-route-serving-drax-power-station-north-yorkshire

transportation of biomass. Previous analysis by MDST suggests that rail has a significant cost advantage over road for the transportation of biomass.[27] This is supported by these recent investments and contract extensions.

Impact of an ICC on the market and its customers

The ICC for biomass is being introduced gradually across CP6, as shown in Table 3.1. While it may be too soon to draw strong conclusions about the impact of this charge, the industry has been aware of the imposition of the ICC for some time and retains strong expectations for its business model and, within that, use of the railway. Furthermore, the ICC was designed and set at a level so as not to have a major impact on demand for rail.[28]

Table 3.1: ICC for biomass in CP6

	2019-20	2020-21	2021-22	2022-23	2023-24
Level of 2023-24 ICC to be paid	0%	0%	20%	60%	100%
ICC value (£/kgtm, 2017-18 prices)	0.00	0.00	0.29	0.87	1.45

Source: ORR (2018), 2018 periodic review final determination – Supplementary document – Charges and incentives: Infrastructure cost charges conclusions, Table 2.1, p. 26. Available at: https://www.orr.gov.uk/media/17233

Wider government policy

Biomass is considered a form of renewable energy by the UK government, and so it may be inconsistent with government policy for green energy if the ICC for biomass were greater than for coal. But environmental concerns surround biomass generation – the tension between government policy for green energy and an ICC for biomass may weaken in the future.

3.2.3. Summary of implications

There has been continued moderate growth in this commodity since the start of CP6, with confidence that this will continue at least until the subsidies expire mid-CP7. Overall, the position of biomass in the short to medium term is likely to be particularly strong due to higher gas prices.

Rail continues to be a competitive mode of transportation of biomass, with no evidence that this has changed since the PR18 assessment – indeed, further contracts have been signed since PR18. While data on the imposition of a biomass ICC to date provides limited insight as to the impact of the charge, the general market position suggests no obvious concerns. Overall, we consider that there is no reason to change the current policy: we recommend that the ORR retain the ICC on biomass.

[27] ORR, Biomass consultation, February 2013, p.8

[28] Specifically, ORR set the ICC such that there is a less than 10% modelled reduction in the gross tonne miles shipped by rail (when fully phased-in). This drew on modelling work undertaken by MDS Transmodal (2018): The potential impact of increases in track access charges on the transport by rail of biomass. Available at: https://www.orr.gov.uk/sites/default/files/om/pr18-the-potential-impact-of-increases-in-track-access-charges-on-the-transport-by-rail-of-biomass.pdf.

3.3. Iron Ore

3.3.1. Context

Demand for iron ore

Iron ore is mainly used as a raw material in the production of steel. In 2020, 81% (5.7m tonnes) of UK steel was produced in Port Talbot (by Tata Steel) and Scunthorpe (by British Steel) using iron ore. The remaining 19% (1.3m tonnes) is produced using an alternative production method, Electric Arc Furnace (EAF), which does not use iron ores in its production process (EAFs generally process scrap metal).

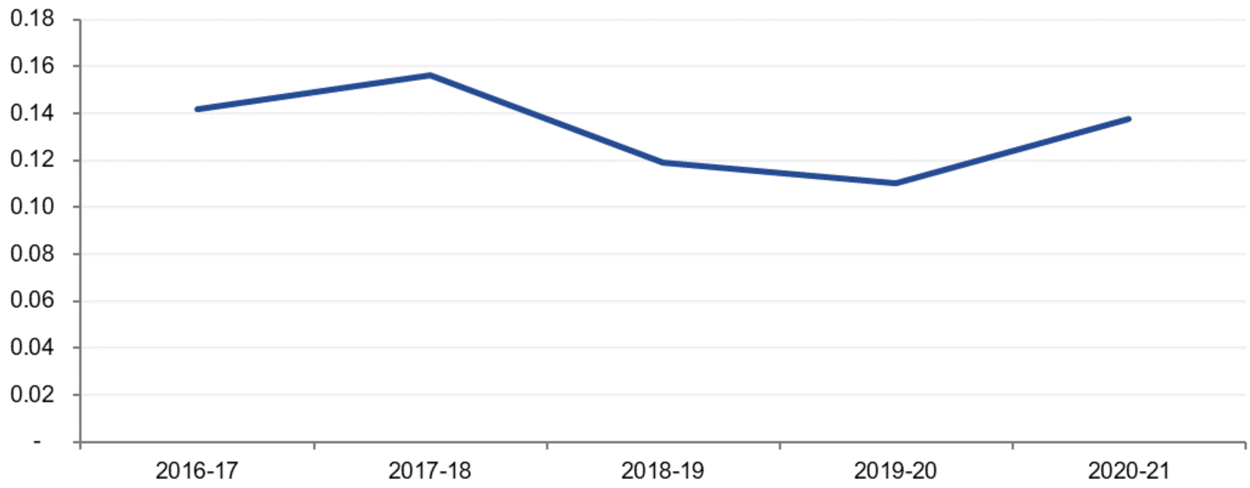
At present, the steel market in GB is experiencing low profitability and high competitive pressure. This is caused by several factors including unpredictable raw material costs, higher energy costs in steel production, and high production and export of low-cost steel from China. There are also environmental pressures on steel production using iron ores, including a move towards EAF steel production (which emits less carbon).[29] Additionally, steel exports have been impacted by the introduction of a tariff on steel exports to the EU and the US.[30]

Demand for rail freight transportation

The main flow of iron ore by rail freight is from the Port of Immingham to the steel works in Scunthorpe. This plant has been owned by British Steel since 2016, which acquired it from Tata Steel. The Scunthorpe plant produces steel for rail (e.g. tracks), construction (e.g. joists) and rods and coils (e.g. for reinforced concrete). The steel works at Port Talbot also require iron ore, but generally receives it directly by ship.

Iron ore transported by rail was relatively stable between 2016-17 and 2018-19, as seen in Figure 3.5. The fall after 2017-18 can be attributed to the closure of two steel mills.

Figure 3.5: Iron ore lifted 2016/17 to 2018/19 (bn tonne-km)



Source: CEPA Analysis of data provided by the ORR

[29] BEIS (2019), Clean Steel Fund: Call for evidence. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/943254/clean-steel-fund-call-for-evidence.pdf

[30] Data available at: UK Trade Info, Category 72: Iron and Steel. Available at: https://www.uktradeinfo.com/trade-data/ots-custom-table/

3.3.2. Analysis

Competition from other modes

Previous analysis of the iron ore market segment indicated that competition from other transport modes is low for the Immingham to Scunthorpe flow. In 2006, MDST found that road transport for iron ore would be around three times the cost of rail transport, so road is not a realistic substitute. At PR18, British Steel estimated the cost of rail transportation to be half the cost of road – this is likely to be currently even lower than half given (potentially temporary) increases in the cost of road haulage. The cost competitiveness of rail is reflected in the long term contracts for iron ore handling and rail transportation.

Cost is not the only element that affects the competitiveness of rail. British Steel has observed that flexibility of road is greater, e.g. via the ability to place orders at very short notice. But there is greater organisational complexity involved in coordinating fleets of trucks to deliver iron ore to the Scunthorpe site, given the potential congestion generated by the high levels of traffic this would require. British Steel has been public in its desire to keep iron ore flows on rail. The existing facilities at the Scunthorpe plant (e.g. machinery lifts and tips rail wagons to unload the iron ore) make rail an efficient solution.

Overall, the use of road for transporting iron ore is a viable option, and so it is not the case that rail will always remain the only viable mode of transport. However, as the relative costs stand at present, road does not appear to be an attractive alternative to rail for the main iron ore flows from Immingham.

Impact of the ICC

The ICC for iron ore was phased in across CP5 (2014-19) and so we now have several years data to use in considering the impacts the charge may be having on the industry and its end customers.

Overall volatility in steel prices is significant and the impact of the ICC on profitability is likely to be very small in comparison – see Figure 3.6. The previous low prices of 2013-2017 resulted in British Steel entering an insolvency process in 2019 (before being purchased later), demonstrating the impact these prices have. The figure shows that as of early 2022, the steel price has fallen back to a more typical level consistent with the previous five years.

Figure 3.6: Steel price changes over 2011-2021 (currency: CNY)[31]

Source: tradingeconomics.com, Steel 10 year prices: https://tradingeconomics.com/commodity/steel

[31] The ICC for CP6 was set at £1.60 per thousand gross tonne miles (in 2017/18 prices) – approximately 13 CNY in March 2022.

Network Rail is the main domestic customer, buying its steel mostly from British Steel or from European counterparts, and it continues to be a strong customer – we have no reason to believe that the charge is causing any issues at its current level.

3.3.3. Summary of implications

Overall, despite the fact that the GB steel industry continues to face challenges, we consider that it is appropriate to retain an ICC for iron ore given the low impact of the ICC in relation to the overall production costs of steel and the much higher costs of road transport, which indicates that the elasticity of demand for freight services remains low.

3.4. Nuclear waste

3.4.1. Context

Supply of nuclear waste

Direct Rail Services (DRS), owned by the Nuclear Decommissioning Agency (NDA) via its subsidiary Nuclear Transport Solutions NTS),[32] is the only rail operator authorised to transport the UK's nuclear waste. While there may be some small road flows, we understand that rail is heavily dominant.[33] There is an ICC for nuclear waste in CP6.

The Government has committed to using nuclear to reach Net Zero. This includes a 2021 commitment to investing £1.7bn "*to enable a final investment decision for a large-scale nuclear project in this Parliament*" and a £385m budget for advanced nuclear research and development.[34] Further, the CCC concluded that nuclear will be a necessary part of our energy mix in the path to achieving net zero by 2050.[35] A new nuclear plant is expected to come online in 2026 (Hinkley Point C).[36]

However, in recent years there has been a decline in nuclear generation, broadly matching the decline in nuclear capacity in the UK. This general decline in recent years is demonstrated in Figure 3.7. It may be expected to continue in the coming years, with five nuclear power plants in the UK due to be decommissioned in the 2020s[37] including Hunterston B[38] which ended its operations in January 2022 and Hinkley Point B[39] which is expected to end its operations later in 2022.

[32] NTS has launched a new design for greener rail transportation of nuclear waste. https://nucleartransportsolutions.com/rail/specialist-nuclear-freight/

[33] There are some short distance flows by road as discussed by Public Health England on p.7 of: PHE (2017), Survey into the Radiological Impact of the Normal Transport of Radioactive Material in the UK by Road and Rail.

[34] Nuclear power in the UK, House of Lords Library. Available at: https://lordslibrary.parliament.uk/nuclear-power-in-the-uk/

[35] The CCC (2021), The Sixth Carbon Budget. Available at: https://www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf

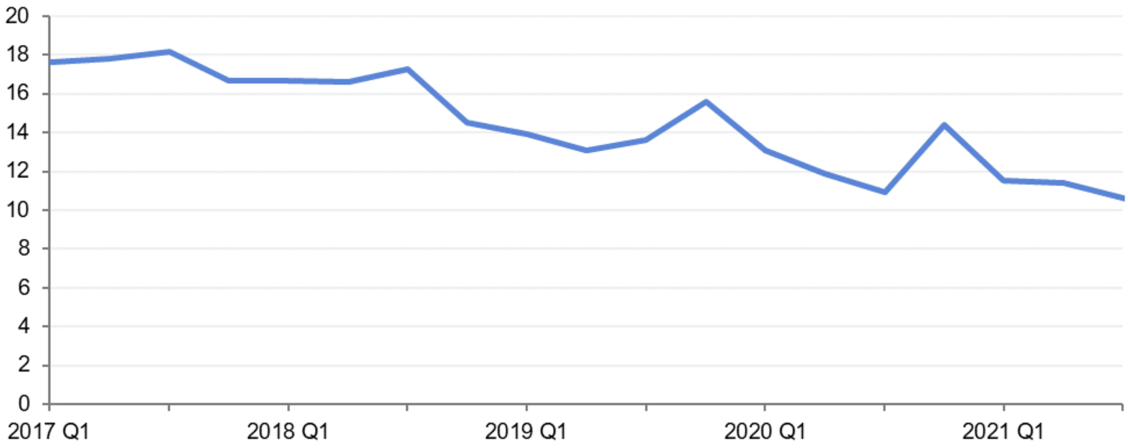
[36] BBC, Hinkley: Hundreds more needed to finish nuclear power station. Available at: https://www.bbc.co.uk/news/uk-england-somerset-57227918

[37] Gov.uk, Nuclear electricity in the UK (special feature). Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/789655/Nuclear_electricity_in_the_UK.pdf

[38] Office for Nuclear Regulation (2022), Hunterston B moves into defueling phase. https://news.onr.org.uk/2022/01/hunterston-b-moves-into-defuelling-phase/

[39] EDF (2022), UK's most productive nuclear power station to move into decommissioning by July 2022 https://www.edfenergy.com/media-centre/news-releases/uks-most-productive-nuclear-power-station-move-decommissioning-july-2022

Figure 3.7: Electricity generated using nuclear fuel in the UK, TWh

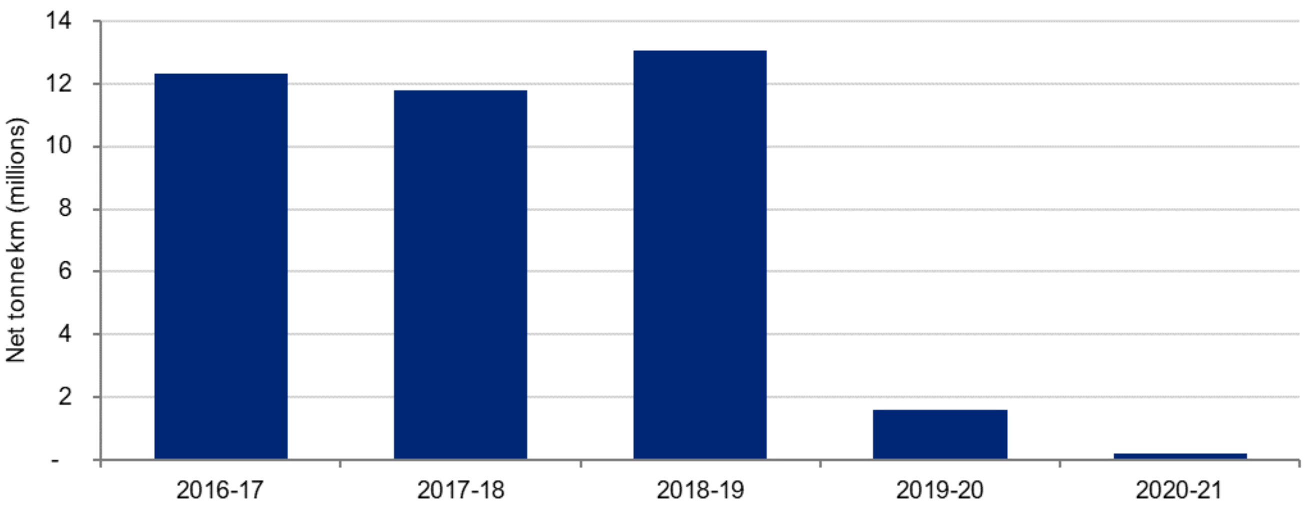


Source: CEPA analysis of BEIS (2021), Fuel used in electricity generation and electricity supplied, Table 5.1b: electricity generated by fuel 1998 to 2020 (TWh). Available at: https://www.gov.uk/government/statistics/electricity-section-5-energy-trends

Demand for rail freight transportation of nuclear waste

The volume moved by rail was fairly steady between 2016-17 and 2018-19, but saw meaningful declines in 2019-20 and 2020-21. This is shown in Figure 3.8, which also shows a fall of 98% between 2018-19 and 2020-21, a more significant fall than the 22% fall in electricity generated from nuclear fuel in that period (see Figure 3.7). DRS (responsible for transportation of nuclear waste by rail) confirms this is due to a change in level of production rather than a move towards another transport mode or different destination.

Figure 3.8: Movements of spent nuclear fuel, net tkm (millions)



Source: CEPA analysis of data provided by ORR.

Levels of nuclear waste may pick up in coming years due to the waste generated in the defueling stage that several power stations will be moving into, and in the longer term we expect increases as new plants come online – e.g. Hinkley Point C is currently expected to come online in 2026. It therefore seems likely that for CP7 'nuclear waste' as a commodity transported by rail, and as an inelastic flow, will continue – even if the volumes are reduced.

3.4.2. Analysis

Competition from other modes

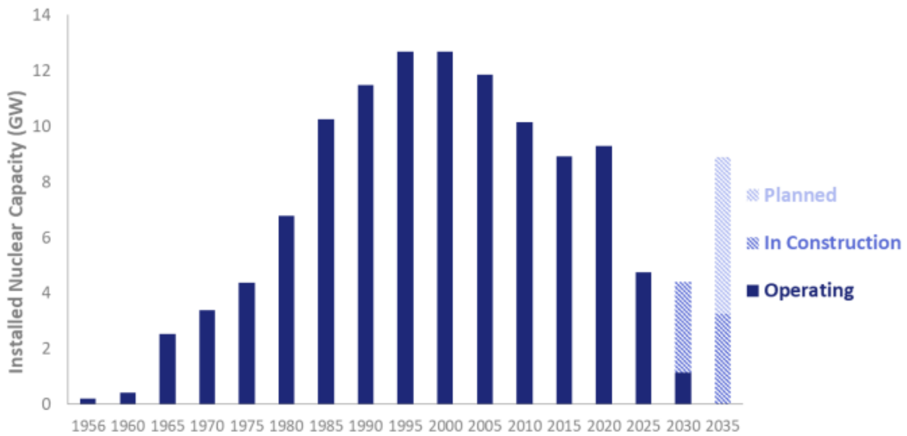
The transport of nuclear waste by rail has a very low elasticity: it would be difficult to transport substantial volumes a by road – given security considerations, public opinion, etc. As such, MDST has previously assumed that the demand elasticity for transporting this commodity by rail is zero i.e. no change in demand in response to a change in the cost of rail freight.[40]

3.4.3. Summary of implications

Overall, the safety-critical nature of nuclear waste means that transportation via any mode other than rail is extremely unlikely in the near future. As such, its impact on demand for rail freight services appears marginal. Given that the ICC is effectively a governmental transfer between NDA and Network Rail, there may be an argument for removing it. However, this would likely have some implications for government departmental budgets and would also represent a move away from rail users contributing to the costs they impose on the network. As such, we recommend maintaining the ICC.

Although the volumes have fallen in recent years to current low levels, our recommendation is that the ICC should remain – the fall has been caused by the reduction in nuclear capacity, but this is expected to reverse in the coming years throughout CP7 and beyond (see Figure 3.9). Unlike with ESI coal, there is no managed decline of nuclear generation, and with a new nuclear plant opening in 2026 no such decline to zero is likely for nuclear waste. We recommend that the ORR continue to monitor changes in the market and government policy on nuclear capacity and generation for future price reviews.

Figure 3.9: UK Installed Nuclear capacity: operating, under construction, and planned plants, 1956-2035



Source: UK Government, Special feature – Nuclear Electricity in the UK.

3.5. INTERMODAL

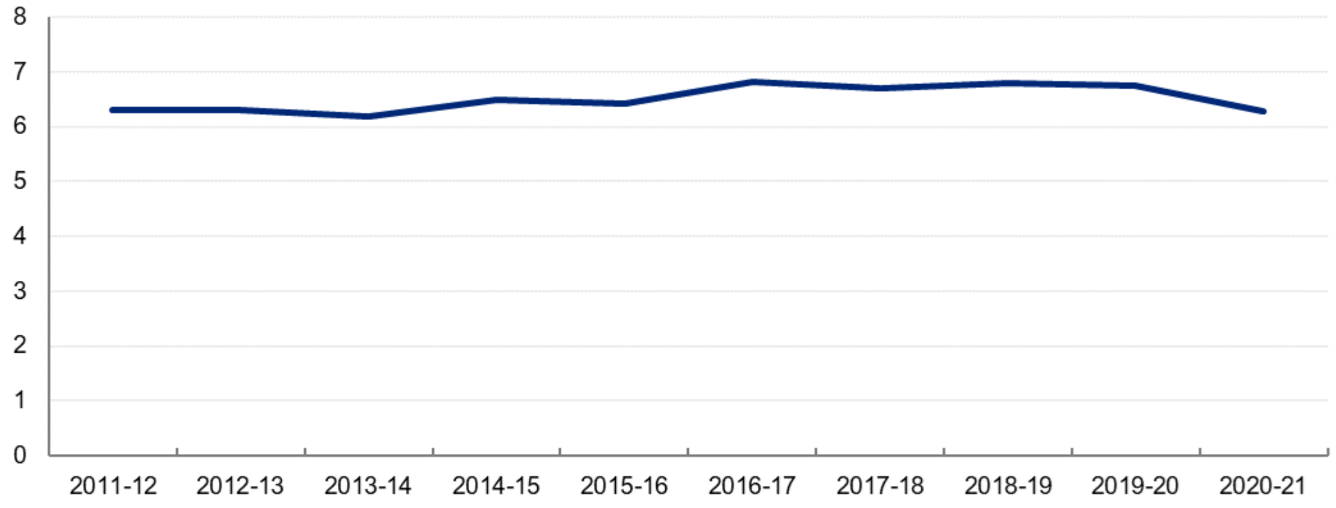
3.5.1. Context

Intermodal transportation is the movement of goods in containers using multiple modes of transportation. The freight itself is not handled when moving between rail and road (or water), which allows for easier transfers.

[40] See Table E1 of MDST's February 2012 report: Impact of changes in track access charges on rail freight traffic, mdst-freight-tac-changes-feb2012.pdf | Office of Rail and Road (orr.gov.uk).

Intermodal freight saw modest growth of 7% between 2011-12 and 2019-20. In 2020-21, intermodal freight movements fell to pre-2014-15 levels mainly attributable to the COVID-19 pandemic.

Figure 3.10: Intermodal freight moved by rail 2011-21 (bn net tkm)



Source: CEPA analysis of ORR Data Portal, Table 1310: Freight moved by commodity. Available at: https://dataportal.orr.gov.uk/statistics/usage/freight-rail-usage-and-performance/

Although growth of intermodal freight was modest between 2011-12 and 2019-20, Network Rail forecasts higher growth in the future. In 2016-17, total freight lifted was 18.5m tonnes. Network Rail forecasts a growth to 26.8m tonnes in 2023-24, to 45.0m tonnes in 2033-34, and to 63.4m tonnes in 2043-44. Five assumptions drive this projected growth, namely:

- the building of inland rail-served warehouses;
- increasing overseas trade;
- longer trains;
- retention of Mode Shift Revenue Support (MSRS) grants;[41] and
- increased fuel and wage costs for road relative to rail.

Mode Shift Revenue Support (MSRS) grants are provided by the UK government for intermodal transport on rail, to support a switch of freight movements from road to rail. The support scheme has run since 2010, and will run until at least 2025.

Network Rail notes that the intermodal freight market can easily switch between road and rail, and is highly price sensitive.[42] Nonetheless they describe a “huge potential market” for intermodal, which is currently “untapped” by rail due to a general inclination to remain with their current mode rather than actively comparing the benefits of rail vs road.

[41] Department for Transport (2020), Guide to Mode Shift Revenue Support (MSRS) Scheme. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/966209/msrs-guide.pdf

[42] Network Rail (2020), Rail freight forecasts, scenarios for 2033/34 & 2043/44, p. 71. Available at: https://www.networkrail.co.uk/wp-content/uploads/2020/08/Rail-freight-forecasts-Scenarios-for-2033-34-and-2043-44.pdf

3.5.2. Analysis

Competition from other modes

In PR18, we found that intermodal rail faces significant competition from road, implying a low ability to bear a charge. This is particularly true for shorter journeys, and this was emphasised by stakeholders in discussions.

Post-Brexit and the collapse in economic activity caused by COVID-19, the UK economy has seen shortages in truck drivers, supply chain issues and inflationary pressures – notably including major increases in fuel prices. There is also an increased urgency for businesses to meet net zero commitments. Container freight trains in Britain now carry up to 38 containers,[43] whereas by road each container is usually carried by a single HGV. In principle, these factors should make rail more attractive to intermodal traffic. There is some recent evidence that this is the case, with major retailers such as Tesco recently crediting increased volumes of rail freight as the key part of their strategy for withstanding these supply chain pressures.[44] This could put rail freight in a stronger relative position, with respect to intermodal traffic. However, for the purposes of this review, it remains unclear how persistent these factors will be. There are also choke-points which limit the expansion of rail freight, and unelectrified sections of the railway that impede use of electric traction – with current demand constrained by capacity constraints, the introduction of an ICC would have less impact than it would if there weren't this capacity constraint, as the current on-rail intermodal flows are those that have a greater inclination to be on rail.

We did not locate any evidence from research or stakeholders indicating that any major new shipping routes have come online that would be considered a significant competitor to rail since PR18 – although changes in existing routes (e.g. growth at Felixstowe) do have some effect on rail freight flows.

Further market segments

In PR18, we noted that there is some evidence of variation in ability to bear across intermodal flows, particularly related to length of haul. We considered whether there is a case for defining further market segments within the existing intermodal market segment, to reflect this. We concluded that further evidence would be required to define sub-segments in this way. We also identified several practical issues with applying an ICC only to certain intermodal flows: for instance, it would create challenges for freight companies in adjusting the way they charge their clients (which is often based on a portfolio approach across several routes), as well as potentially encouraging the use of split trains to avoid ICCs on trains that travel above a threshold distance. As such, we did not define sub-segments in the intermodal market segment based on geographic flows or distance travelled.

We have reconsidered this issue in the context of PR23, particularly in light of the literature review presented in Section 2.3. Many of the issues identified in PR18 (e.g. the use of portfolio pricing, the use of split trains) remain relevant today, and are likely to remain so in future. We also recognise there is a risk that levying a charge based on distance travelled could create perverse incentives to amend the routes used to transport intermodal freight, creating complexities for freight users. However, these issues are not necessarily insurmountable. Phasing in an ICC (as was done with biomass for CP6) could help companies to adjust their business models and charging approaches. It is also possible to carry out analysis into how to segment the market to suggest more route-based rather than 'distance-based' segmentation, which could mitigate the perverse incentives explained above by ensuring freight companies would not see any benefit in splitting their trains.

As such, there is value in considering what further evidence can be obtained on the relationship between length of flow and ability to bear. While we have found no clear evidence as part of this review, we would encourage the ORR to consider it further in future data collection and analysis. In this context, we note that MDST's updated analysis for PR23 may provide further insight in this area.

[43] Raifreight.com (Dec 2020), UK longer freight trains for longer term growth, available at https://www.railfreight.com/railfreight/2020/12/17/uk-longer-freight-trains-for-longer-term-growth/

[44] The Guardian (2021), Tesco credits use of rail freight for keeping shelves stocked in supply crisis. Available at: https://www.theguardian.com/business/2021/oct/06/tesco-profits-double-as-shelves-stay-stocked-despite-supply-chain-problems

Other factors

The Department for Transport's "Mode Shift Revenue Support" (MSRS) grant scheme specifically supports the movement of intermodal freight by rail than road through funding additional operating costs. The support is justified based on environmental benefits and provided to users based on maximum value for money. Applying an ICC could be in tension with this policy, and in some respects could be circular, if the additional costs were used to justify an application for MSRS.[45] The scheme is currently due to expire in 2025 (after 1 year of CP7) and decisions have not been made on its renewal.

3.5.3. Summary of implications

There are several factors affecting the nature of rail/road competition in intermodal freight at present, but it is unclear how persistent they may be.

It is also intuitively plausible that longer distance intermodal flows are less elastic than shorter flows, due to potential cost savings by rail on longer routes as compared to road. This could make those longer flows more captive to rail and therefore suitable for an ICC. However, we have found no evidence in either direction on which to form a considered opinion. We recognise that the current ongoing MDST study is looking into this area, which may help the ORR to develop an understanding of whether an ICC would be likely to damage growth prospects. We highlight that the ORR should keep this area under review for future price reviews.

Based on current evidence, it is difficult to conclude there has been a meaningful and persistent shift to rail such that we could confidently recommend introducing an ICC for CP7. Accordingly, we do not recommend an ICC for this commodity for CP7.

3.6. Aggregates

3.6.1. Context

Demand for aggregates

Aggregates are a range of particulate materials used in construction (often listed as 'construction', e.g. in the ORR's freight data series). It includes, among others, "*aggregates for road construction or general building works, as well as concrete and cement products. It includes timber traffic and High Speed 2 (HS2) construction traffic*".[46] What they have in common is that the cost of transportation is a large part of the delivered cost to the customer.

The main customers are construction companies. Rail is occasionally used to transfer material to (or in the case of construction spoil, from) a rail-connected site. But the main use of rail in this sector is to transport material from quarries and ports to distribution centres. Final transportation from these centres to customers is usually by road.

Figure 3.11 shows that the construction industry has seen sustained growth from 2013 to 2019. There was a sharp decrease in construction output in 2020 due to the COVID-19 pandemic and associated lockdowns. Recovery has been rapid, with 2021-22 Q2 data up 20.5% on the same quarter in 2020-21, and up 9.2% compared with 2019-20 Q2.[47]

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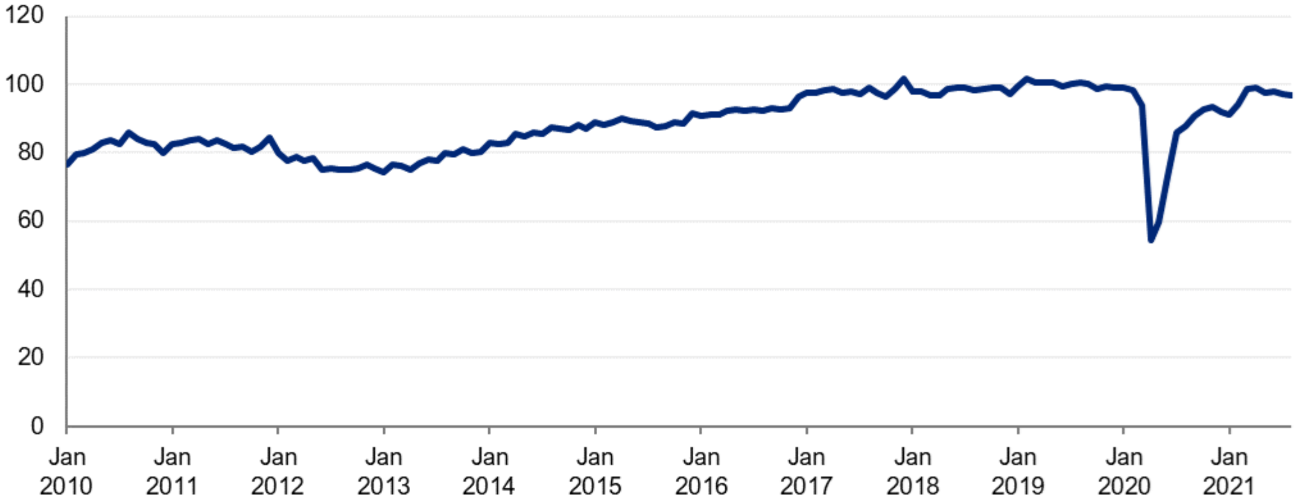
[45] This is because an ICC for this commodity would lower the level of public funding required to recover Network Rail's fixed costs, but at the same time would result in higher MSRS payments.

[46] https://dataportal.orr.gov.uk/media/1233/freight-quality-report.pdf

[47] ORR (2021), Freight rail usage and performance 2021-22 Quarter 2. Available at: https://dataportal.orr.gov.uk/media/2040/freight-rail-usage-and-performance-2021-22-q2.pdf

Figure 3.11: Construction output 2010 to 2021 (2019 = 100)



Source: CEPA analysis of ONS (August 2021), Output in the Construction Industry, Table 10: Construction output: All Work Summary. Available at: https://www.ons.gov.uk/businessindustryandtrade/constructionindustry/datasets/outputintheconstructionindustry

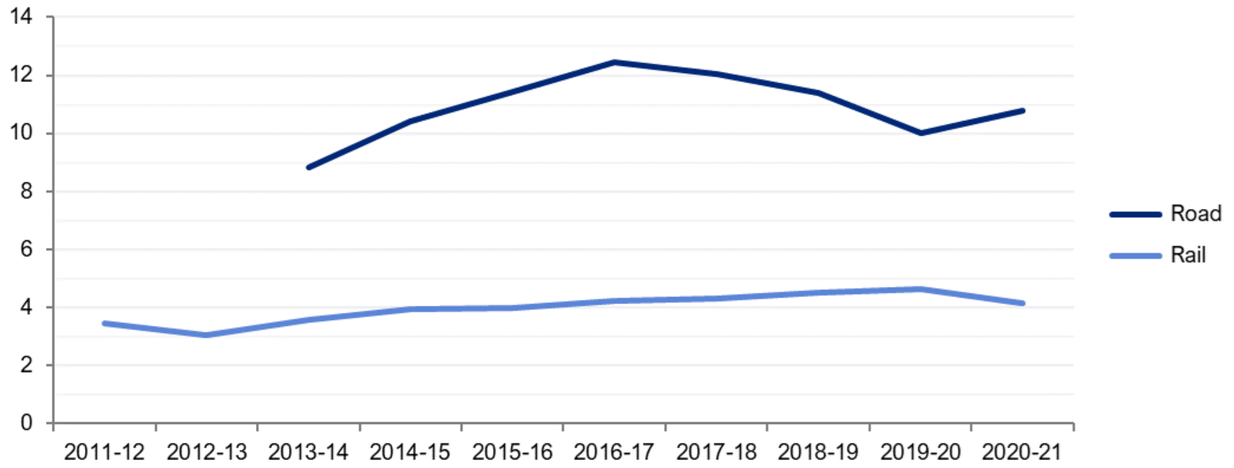
Demand for rail freight transportation

Some major areas of construction activity are located away from major sources of aggregate. There are high levels of construction activity in the south-eastern and north-western population centres of England which are not well served by good local sources of construction aggregate. Large quarries for suitable material are mainly located in the south-west of England, central England, and Scotland. The largest source of aggregate in the UK is Glensanda super quarry in Scotland, whose output is moved by sea to ports in the UK and abroad. Its main landing point in SE England is rail-connected Thamesport in Kent, enabling onward movement by rail. Some major quarries in SW and central England routinely move their output by rail to distribution centres in SE England and other areas of the country. There are also numerous smaller quarries in the country, which deliver their product by road.

The quantity of aggregates moved by rail follows roughly the same pattern as construction output, as seen in Figure 3.12. Aggregates moved increased by 9% between 2016-17 and 2019-20, and dropped in 2020-21 due to the COVID-19 pandemic. Aggregates movements are quickly getting back to pre-pandemic levels, with 1.3bn net tkm moved in 2021-22 Q1, the highest value of any quarter of available data (since 1998-99). This increase is caused in large part by demand for aggregates from the rail sector itself, most notably for HS2 and the Elizabeth Line.[48]

[48] RailFreight (2021), Freightliner moves aggregates records in the UK. Available at: https://www.railfreight.com/railfreight/2021/05/04/freightliner-moves-aggregates-records-in-the-uk/

Figure 3.12: Aggregates moved 2011-12 to 2020-21 by rail and road (bn net tkm)



Source: CEPA Analysis of multiple sources – road data is calendar years (e.g., 2013 is presented as 2013-14), rail data is financial years as presented. ORR Data Portal, Table 1310: Freight moved by commodity. DfT (2021), Road Freight Statistics: 2020, Table 0104: Good moved by commodity: annual 2004-2020.

More aggregates are transported by road than by rail in terms of bn net tkm. In 2020, 10.80bn net tkm of aggregates were moved by road (Figure 3.12). This is 2.3 times as much as by rail. But aggregate movements by road fell between 2016 and 2019, whereas by rail a steady increase was seen.

3.6.2. Analysis

Competition from other modes

In PR18, we noted that transport costs are a high proportion of the delivered cost for aggregates, and that there exists strong competition exists between road and rail for this commodity. This means the choice of mode used to transport aggregates is likely to be particularly price sensitive; indeed, previous analysis undertaken by MDST indicates that rail freight demand for this commodity is one of the most elastic of all commodities, and any increase in charges will "significantly affect how they [aggregates] are delivered".[49]

Furthermore, competition between road and rail is not as simple as a standard mode shift. There are many sources of aggregates across the country, and a relative change in the cost of rail may also affect where the required aggregates are sourced from (i.e. a move to more local sourcing). If rail costs increase, to some degree other road-connected aggregate sources will become more competitive relative to the rail-connected sources. This is a further reason why rail freight demand is likely to be sensitive to changes in the cost of rail freight.

Other factors

While stakeholders are optimistic about this commodity in terms of its ability to grow rail freight, and current demand is strong, there are headwinds. Some of the current high level of activity is attributable to "catch-up" construction, particularly in the residential sector, which may not be maintained in the medium term.

3.6.3. Summary of implications

Aggregates remain a significant source of rail freight movements and demand has been strong. However, we have found no evidence to contradict previous findings that demand for rail-moved product is sensitive to price changes – i.e. if the ORR were to introduce an ICC, there would likely be a material impact on rail freight demand for this commodity. We therefore do not recommend an ICC for aggregates.

[49] MDST (2012), Impact of changes in track access charges on rail freight traffic, p. 23. See also Table E1

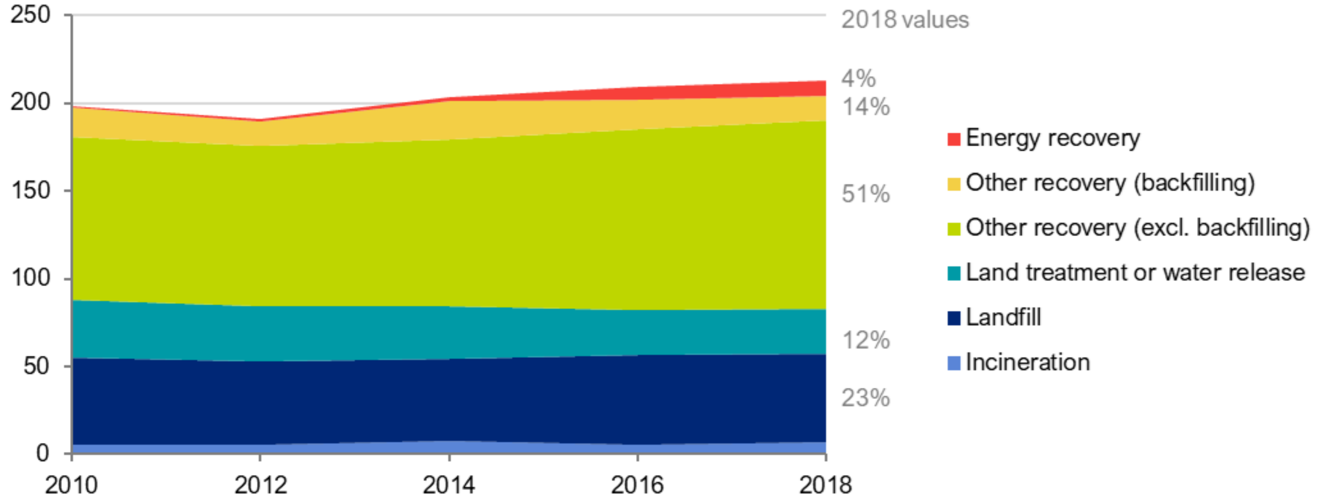
3.7. Domestic Waste

3.7.1. Context

Demand for domestic waste transportation

The total volume of waste transported in the UK has increased by less than 10% since 2014,[50] and the mass treated has stayed broadly steady over the same period – as shown in Figure 3.13.

Figure 3.13: Total UK waste (non-hazardous) sent to treatment in the UK, million tonnes)

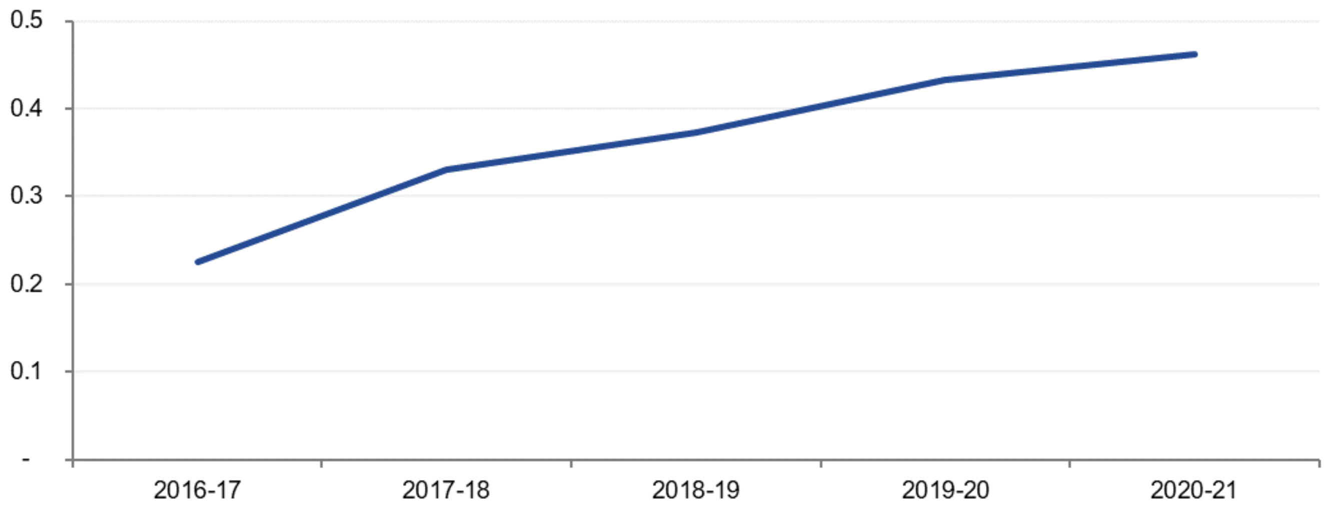


Source: Analysis of Defra (2021), ENV23 – UK Statistics on Waste, Table 5.4. Definitions of types of use are provided by the EU.

Demand for rail transportation of domestic waste

The tkm of domestic waste moved by rail each year has more than doubled since the start of 2016/17, as seen in Figure 3.14.

Figure 3.14: Rail freight movements of domestic waste, in GB by financial year (billion net tkm)

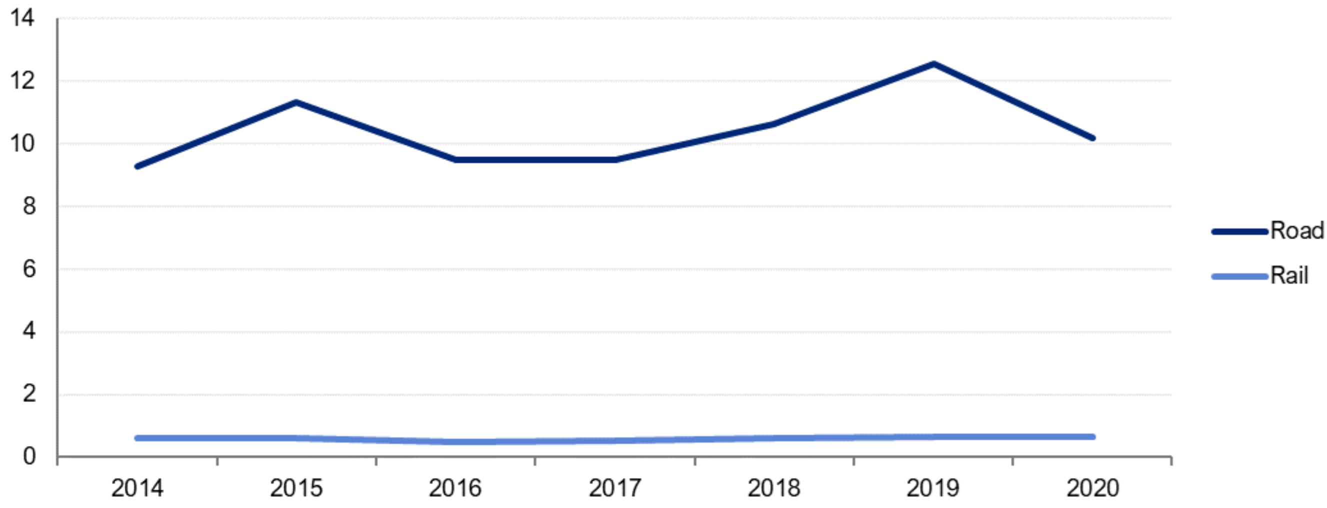


Source: CEPA analysis of data provided by the ORR

[50] DfT, Annual releases of TSGB0402, Domestic freight moved: by commodity.

The growth in rail tkm in the ORR data was the motivator for looking more closely at the sector as part of this market-can-bear review. However, this growth is from a relatively low base, and this commodity still accounts for a small proportion of overall rail freight flows (albeit greater than some commodities which currently pay an ICC). Furthermore, as shown in Figure 3.15 (DfT data on 'waste related products'[51] per tkm moved by road and rail), the vast majority of waste-related products in recent years have been moved by road rather than rail, and the addressable market may therefore be significantly larger than current rail freight volumes.[52]

Figure 3.15: Waste related products moved by road and rail, 2014-2020, bn tkm – DfT data



Source: CEPA Analysis of DfT data series TSGB0402, annual publications from 2015 to 2021.

From discussions with stakeholders, we understand that two likely contributors to changes in the industry in recent years are waste-to-energy and other recycling, as both have increased in recent years, and typically require moving waste from urban sources to more rural areas with large processing plants.

These factors may tend to change the geography of waste movements, resulting in rail destinations receiving waste material from a wider area. For example, Biffa has opened a rail-linked domestic waste transport hub in London in 2021, to transport waste out of London and to sites in the north of England,[53] and we are aware of a 25-year contract starting in 2016 for moving waste from west London to a waste-to-energy plant near Bristol.[54] These changes may mean waste is more efficiently transported these longer distances by rail (rather than its previous shorter distances by road), or that waste previously transported by rail has remained on rail but being transported a longer distance. Either would increase the data on movements – as this measure includes both mass and distance (tkm) – and future analysis would benefit from further information breaking out information such as tonnage, routes, and distances.

[51] Intermodal rail is specifically used for some types of waste,

[52] *The DfT data shows a smaller change in rail tkm than seen in the ORR data (0.12 bn tkm between 2017 and 2020) – though this data covers a wider category of waste-related products and is not directly comparable with other rail figures such as in TSGB0401.*

[53] GB RailFreight (2021), London laid waste by GBRf and Biffa.

[54] Suez (2016), Operations begin at Severnside energy recovery centre – marking an end to landfill for West London's waste.

3.7.2. Analysis

Competition from other modes

Road typically moves over 90% of domestic waste (by tkm) according to DfT classifications.[55] The relatively low market share of rail in the transportation of domestic waste, and low growth in tonnage in recent years, suggests that it is unlikely there is low elasticity in this area (i.e. unlikely that the rail users would tolerate a higher charge).

However, the evidence for the elasticity of this flow is mixed. MDST's 2006 analysis[56] presented a 0.0 price elasticity of demand. The ORR presented a stronger response in its May 2012 consultation, although this was in part due to assuming the flow to be most similar to intermodal (one of the most elastic flows).[57] MDST is currently seeking to update its demand elasticity estimate for this market segment, and so this information will be available to the ORR soon.

We understand that many current waste contracts are with Local Authorities which may find it difficult to absorb costs on a short-term basis (i.e. before they are able to pass costs through in new contracts), and so in the short term we would expect domestic waste to be more elastic – customers may switch to road to avoid a new ICC. Further stakeholder engagement to understand these dynamics would be appropriate if the market continues to experience strong growth in CP7.

Further market segments

As a growing sector,[58] it is possible that some sub-segments may emerge with higher ability to bear than others. Figure 3.13 showed that there is a clear divide in treatments of domestic waste – one of which is waste-to-energy.

At the current volumes it would be disproportionate to introduce a new ICC for these flows, but it may be worth considering in future given the likely increase in the use of waste-to-energy.

Other factors

The change in distances/flows of domestic waste may be caused by change in treatment of waste – requiring it to be transported to different locations, such as 'waste to energy' plants or repurposing (e.g. 'other recovery'). This makes sense given the drive towards a more 'circular economy' (i.e. more reuse or recycling), and we might expect further progress towards this in the future. For example, we have seen Biffa and GB Railfreight collaborate to open a new transport hub for coordinating waste movements, with it planning to move 50% of its waste by rail by 2025 as part of its drive to reduce its carbon emissions.[59]

3.7.3. Summary of implications

Overall, we do not consider the evidence is strong enough to suggest that domestic waste could bear an ICC in CP7, given the small size and short period of growth witnessed. The position of domestic waste is broadly similar to, if less certain than, that of biomass at the time of the PR13 determination (when it was decided not to levy an ICC on the biomass market segment). There has been a steady increase in flows of domestic waste on rail in recent years, but the future pipeline is less certain and we do not have visibility of the market to allow us to understand the future trajectory (in a way such as we do for nuclear and biomass in particular).

We encourage the collection and review of more detailed information on the flows of domestic waste on rail, to further understand the driving factors of the increase in tkm – including working with stakeholders. This will facilitate

[55] DfT, Annual releases of TSGB0402, Domestic freight moved: by commodity

[56] MDST (Nov 2006), Impact of track access charge increases on rail freight traffic

[57] ORR (2012), Consultation on the variable usage charge and on a freight-specific charge, Table 6.2 .Available at: https://www.orr.gov.uk/sites/default/files/om/freight-charge-consultation-may2012.pdf

[58] See for example growth reported by SUEZ: https://www.euwid-recycling.com/news/business/single/Artikel/suez-posts-significant-growth-in-waste-management-revenue.html

[59] Biffa.com (2021), Biffa turns derelict land into emission reducing transport hub

a more detailed analysis in CP7. It would also be reasonable for Network Rail to look into its categorisation of domestic waste and to consider if and how some of the growing areas (recycling, waste to energy) are captured.

4. SUMMARY OF RECOMMENDATIONS

Based on the analysis presented in Section 3, our key recommendations are as follows:

- We recommend maintaining the same market segments for PR23 as were used at PR18.
- We consider that the current set of ICCs should be maintained, other than for ESI Coal, which we recommend removing (pending a further review of forecast volumes for this commodity later in PR23)
- We do not recommend levying an ICC on any further commodities in CP7. However, we recommend monitoring how the 'other coal' and domestic waste commodities segments continue to develop over the course of CP7.

We summarise our findings in Figure 4.1.

Figure 4.1: Summary of our recommendations

Coal	• The coal market, as it relates to rail, is split into two: coal used for electricity generation – "electricity supply industry" or ESI coal; and coal used for other purposes. At present ESI coal is charged an ICC, and other coal is not. • We recommend that the ESI coal ICC is removed, unless by the time of PR23 final determinations the forecast for future ESI coal movements suggests that it is likely that movements will continue past the first year of CP7. • We do not recommend that a ICC is introduced for 'other coal' for CP7, as there is no clear evidence that this segment could bear an ICC. • We do not recommend, at this time, any changes in the definition of these two sub-segments, but recommend that they are included in any future reviews in this area.
Biomass	• At present the biomass ICC is being phased-in over the course of CP6. The charge in 2021-22 is 20% of the level it will be in 2023-24. • We recommend that the ICC for biomass is maintained for CP7. The strong future outlook for this market and its commitment to rail suggest that this segment is able to bear the existing ICC.
Iron ore	• At present iron ore is charged an ICC. We recommend that an ICC for iron ore is maintained for CP7 given that competition from other modes remains low, and the ICC is relatively small in relation to the overall production costs of steel.
Nuclear waste	• At present, nuclear waste is charged an ICC. We recommend that an ICC for nuclear waste is maintained for CP7 due to the affordability and competitiveness of rail.
Intermodal	• At present intermodal is not charged an ICC. We do not recommend that an ICC is introduced for CP7, as the commodity as a whole continues to face competition from road. • Further evidence (e.g. bespoke studies of demand elasticities) would be required to understand how ability to bear varies across different intermodal flows, particularly by length of flow.
Aggregates	• At present aggregates is not charged an ICC. • We do not recommend that an ICC for this commodity is introduced for CP7 given that competition from road for aggregates flows continues to be strong, and demand for rail freight is therefore likely to be sensitive to increases in charges
Domestic waste	• This commodity has not been assessed in detail before, but due to its increasing volume we have undertaken some initial market-can-bear analysis At present domestic waste is not charged an ICC. We do not recommend that an ICC for domestic waste is introduced for CP7 but recommend ongoing monitoring of this market with a view to informing any future review.

Appendix A. Rail Freight Elasticities: Evidence Review

A.1 Overview of Freight Elasticities Evidence

A large scale review of international literature on the empirical evidence on rail cost elasticities was carried out by VTI and Significance (2010). Many of the values covered in the review are derived from estimation of largely disaggregate, cross sectional freight mode choice models.

The review categorises three types of market response mechanism – ways in which rail freight demand may change in response to a change in rail access charges:

- Mode shift – transferring the freight by a different transport mode, e.g. road.
- Change in route/destination – a change in the cost of rail transportation could encourage freight customers to change their freight paths, destinations, etc. As we measure the market mostly in tkm, the same volume of goods being moved to a different destination can change the understood size of the market.
- Change in demand for the commodity – if the higher rail charge is passed onto the final consumer, we would see a reduction in tonnes transported by rail.

Based on the literature, the review summarises the likely range of elasticities as shown in *Table A.1*.

Table A.1: Results from VTI and Significance (2010)

	Elasticity type		
Price change	Tonnes	Vehicle (vkm)	Tonne km (tkm)
Price per vkm	-0.5 to -1.1	-0.9 to -1.5	-0.6 to -1.2
Price per tkm	-0.8 to -1.6	-0.9 to -1.7	-0.9 to -1.7

The most common form of elasticity reported on in the literature is price per tkm, impact on tkm, as shown in the bottom right cell of the table. The other elasticities (response per tonne or vkm and from changes in price per vkm) were derived by VTI and Significance based on observed differences between these elasticities. These adjustments reflect the following:

- Tkm elasticities, which take into account all response mechanisms, are generally higher than tonne elasticities, which do not take into account changes in route/destination: Specifically they assume/estimate -0.1 of the -0.9 to -1.7 range is for total transport demand (i.e. rest is mode shift)
- Elasticities based on price per vkm are reported as lower as the authors assumed operators internalise 30% of vkm price change (partly through loading efficiency)

We note that elasticities based purely on mode shift would be lower as they do not take into account changes in route/destination or commodity demand.

Whilst this is a useful overview, unfortunately the VTI study does not provide clarity on expected elasticities or ranges by distance band or commodity type. The study does present constituent elasticities for different modes from the different studies but does not synthesise these, presumably because there is too much variation, uncertainty, and incompatibility of such estimates. This variation could stem from use of different data sets, spatial scope, time period, degree of aggregation and modelling approach.

This highlights the overall lack of consistency of more detailed evidence. For those breakdowns, we have to look at some key individual studies.

A.2 Variation in elasticities by commodity type

In terms of different commodities, the VTI study find price sensitivities generally larger for general cargo as compared to bulk. This is a similar finding to that shown in more recent discrete mode choice modelling work undertaken by Jensen et al (2018) for the EU's Transtools (3rd version) model (using data from ETIS+ calibrated to French and Swedish commodity flow data)

Table A.2: Rail modal share elasticities from Transtools model- selected results from Jensen et al (2018)

Price change	Elasticity
Dry bulk	-1.9
Liquid bulk	-0.94
Container	-1.36
Rail Generalised Cargo	-5.68

This finding of lower bulk elasticities is echoed in more detailed commodity breakdowns, in part a reflection of lower competitiveness from road. In part rail's market advantage comes from the long distances and heavy loads involved and, as highlighted in MDST (2006) in some cases higher levels of rail connectivity for bulks, e.g. aggregate flows and steel plant movements which are directly connected at both ends.

More recent findings on elasticities from the academic literature, from Jourquin and Beuthe (2019), are shown in Table A.3. These are based on ETIS Plus data from 2010, with transit times and costs per tonne computed for OD pairs and then used in a logit analysis using NODUS modelling software for the EU at the NUTS2[60] (regions) level. The approach was also applied at the more disaggregated NUTS3 level to Benelux[61] sub-group where there is more competition (e.g. from IWW).

The results show lower elasticities for solid bulk commodities e.g. solid fuels and fertilisers with higher rail market shares. As mentioned above, rail generally has a competitive advantage for transporting these commodities compared with road. The higher elasticities are for iron & scraps and chemical products and petroleum products, foodstuffs & fodder which have lower market shares.

Table A.3: Commodity specific market elasticities from Jourquin and Beuthe (2019)

	EU Nuts 2		Benelux Nuts 3	
	Rail market share	Rail cost elasticity	Rail market share	Rail cost elasticity
Agriculture	7.8	-1.46	2.5	-0.48
Foodstuffs and fodder	1.7	-1.53	1.2	-2.02
Solid fuels	66.3	-0.83	58.6	-0.43
Petroleum products	9.4	-1.91	4.01	-1.33
Iron and scraps	10.9	-2.10	4.0	-4.82
Metal products	17.3	-1.61	13.8	-0.98
Minerals/build materials	13.4	-0.89	5.9	-0.18
Fertilisers	61.6	-1.00	63.2	-0.66
Chemical products	10.3	-2.25	5.3	-3.82

[60] The NUTS classifications are described at: https://ec.europa.eu/eurostat/web/nuts/background

[61] The Benelux Member States of the European Union (EU) are: Belgium (BE), the Netherlands (NL) and Luxembourg (LU). https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Benelux

	EU Nuts 2		Benelux Nuts 3	
Machinery and containers	8.0	-1.43	4.8	-4.32

More commodity specific findings from other studies are highlighted below:

- MDST (2006) find higher tkm elasticities from runs of the Great Britain Freight Model for Maritime containerised traffic (-2.5), and domestic IM/Wagonload (-1.8). Clearly there is a high degree of competition from road in these categories. The lowest elasticities were for waste (0), nuclear (0), non-power station coal (-0.3), metals (-0.7) and ore (0). Liquid bulks, i.e. Petroleum and Chemicals have higher elasticities than the solid bulk commodities. Low elasticity for waste is explained in terms of long-term contracts and railhead consolidation into containers to rail linked landfill sites. Nuclear traffic is captive to rail due to security requirements. Full details of these elasticities can be seen in Table A.5.
- Beuthe et al (2014), conducting modelling of Belgian freight flows based on the NODUS model with 2005 data, also find lowest elasticities in solid bulk categories metallurgical products (-0.54) and fertilisers (-0.61). The highest elasticities (all around unity) were in chemical products and food and “diverse”. Containerised traffic also had a relatively high elasticity of -0.87.

Results from Oum et al (1992) highlight the sensitivity of results to different model specifications, e.g. with Wood and wood products ranging from -0.05 through to -1.97 for different model types.

It is important to note that where rail has high elasticities and low market share, this may not indicate growth potential: not all barriers to rail (or to road) can be captured through a cost-based approach, particularly in the short run where capacity may not be available.

A.3 Variation in elasticities by distance

Generally, there is less evidence of how elasticities vary by distance band than by commodity. Using Belgian freight flows, Beuthe et al (2014) find elasticities decrease with distance, as shown in Table A.4, as there is less competition from other modes over longer distances. However, the variation between distance bands is fairly moderate.

Table A.4: Elasticities by distance band from Beuthe et al (2014)

	<500km	500-1000km	>1000km
Tonnes	-0.78	-0.73	-0.62
Tkms	-0.78	-0.72	-0.61

Beuthe (2001) also observes rail elasticities are *smaller* for long distance transports than for short transport where they have a small market share i.e. road cost increases relative to rail as distance increases. As well as lower rail elasticities by distance, (Oum, 1979a) also find truck elasticities rise with distance where they face more rail competition.

A.4 Track access charge (TAC) elasticities

There is little specific evidence on sensitivity of rail traffic to changes in track access charges – but the TAC elasticity is sensitive to the proportion of total freight cost it comprises, i.e. the smaller the proportion TAC represents of overall total freight costs, the lower the TAC elasticity.

Bacares et al (2020) conduct an empirical investigation of price sensitivity to traffic using fixed effects estimation on a panel dataset of traffic and prices from sections of almost the entire French railway network from 2003-2016.

Results suggest an increase of 1% of freight access charges will lead to reduction in demand for freight paths of 0.051% (i.e. an elasticity of -0.05).

As the basis for the commodity specific elasticities reported earlier, MDST (2006) conduct some specific model runs of GBFM focusing on changes in track access charges. Results are reproduced in Table A.5.

As with cost elasticities, the lowest TAC elasticities are for solid bulks. For reasons discussed earlier when discussing cost elasticities, low TAC elasticities reflect competitive advantage of rail. For example, given the traffic is largely between industrial plant or to rail linked depots, metal traffic is insensitive to TAC increases, with a 50% increase in TAC leading to 7.9% fall in tkm. Higher elasticities are seen for containerised traffic and other minerals which include aggregates which can be relatively easily substituted to road if rail costs rise. For example, they find an increase of 50% in TAC lead to 15.7% fall in total tkm for deep sea containers (and hence a TAC elasticity of -0.32 reported in the final column of the table) and 12% for short sea traffic (leading to a TAC elasticity of -0.24).

However, as noted in the MDST report, the impact of TAC is sensitive to assumptions about rail cost composition, what proportion is TAC, how much collection and delivery road haulage is involved in rail freight flows and what the relative cost of this is. The presented results on TAC from MDST do not include any costs from road hauls. We can assume that the TAC elasticities could plausibly be lower if road haulage costs were included in the rail generalised cost estimation because a given TAC change would represent a lower proportionate change in overall costs with road haul costs included.

Table A.5: Track Access charge modelling results from GBFM (Source, MDST, 2006)

Commodity group	Mean length of haul	TAC per tonne (£)	TAC % of rail cost	Elasticity wrt rail cost	Elasticity wrt to TAC
Maritime	362	1.29	8-12%	-2.5	-0.32
- of which deep-sea ports	368	1.31	8-13%	-2.6	-0.32
-of which short-sea ports	270	1.01	6-11%	-2.3	-0.24
Coal, of which	165	0.78			
-PS	170	0.81	25%	-0.1	-0.02
-Other		0.38	11%	-0.3	-0.03
Metals	195	0.7	15%	-0.7	-0.11
Ore	41	0.19	7%	0	0
Other minerals	161	0.58	14%	-4.1	-0.55
Auto	328	1.23	15%	-1	-0.15
Petroleum & Chemicals	208	0.74	16%	-1.2	-0.19
Waste	112	0.4	11%	0	0
Domestic Intermodal	364	1.35	8-13%	-1.8	-0.23
-of which Nuclear	307	2.79	9%	0	0
Mail/Prem logistics	530	2.46	24%	-1.2	-0.28
Own haul	189	0			
Channel Tunnel	306	1.15	7-11%	-1	-0.12
Grand TOTAL	189	0.71	17%	-1.3	-0.21

Note: where a range of TAC is presented the lower value assumes a road haul leg. Elasticities do not assume a road haul leg.

A.5 Summary

This Appendix reviews the evidence on rail freight cost elasticities. Overall, the evidence covered here does suggest lower rail cost elasticities for longer distance traffic and lower elasticities for some bulk categories (particularly dry bulks). Long distance and bulks are where rail is likely to have the clearest advantage over other transport modes. This could be for example through long term contracts or private sidings at industrial sites. Also, such goods are heavy and may be required in large loads over long distances, again suiting rail. As such, it is these markets where ICCs would potentially have less impact on competitiveness with respect to other modes.

Conversely higher rail freight cost elasticities were found for non-bulks, particularly containerised and wagonload traffic where there is much competition from road (and possibly inland waterway and coastal shipping in some contexts).

Tkm-based elasticities are generally larger than those from tonnes or modal shares given the scope to adjust length of haul in response to cost changes.

What is apparent from the evidence is that there is a lot of variation between studies, based on year, data (spatial scope, scale, and commodity categorisation) and modelling approaches.

There appear to be no reliable multi-sourced reliable estimates of rail freight cost elasticities per se (just large ranges), let alone of elasticities for distance band and commodity. As such it is not possible to identify commodity and/or distance specific values through the existing literature. There is not enough consistency to identify ‘trends’ in elasticities over time and certainly not possible to provide evidence on which elasticities may have changed more recently. The MDST study being undertaken simultaneously with this report will seek to provide clarity in this area.

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