Potential reductions in congestion on the strategic road network from alternatives to HGV use

Report prepared for Campaign for Better Transport

MTRU

April 2015

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Contents

Metropolitan Transport Research Unit
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April 2015

Executive Summary

Would transfer of freight from road to other modes make a significant reduction in congestion?

This piece of research addresses a key issue for freight transport and road capacity: whether the use of alternatives to road freight could create a noticeable reduction in congestion now or in the future. The key to understanding this issue is to separate out the national average picture across all road types from the impact on the most heavily used roads where congestion occurs. In addition, it is important to separate out the activity of the largest goods vehicles from those which are undertaking local deliveries and are less likely to be replaced by modes such as rail or water.

Thus the use of national averages has created an assumption that actions which change patterns of transport demand do not have a significant impact on strategic national networks. The National Policy Statement contains the following statement:
"In general, the nature of some journeys on the Strategic Road Network means that there will tend to be less scope for the use of alternative transport modes. If rail use was to increase by 50% (in terms of passenger kilometres) this would only be equivalent to a reduction of 5% in all road use. If freight carried by rail was to increase by 50% (in terms of tonne kilometres) this would only be equivalent to a reduction of around 7% in goods carried by road."

The statistics in this statement are of course correct when average figures for all road freight are used, but there are three important qualifications:

1) They do not apply uniformly across the road network – some parts of it have more HGV traffic than others, and in particular more goods which could be carried by other modes, for example to and from the ports;
2) The reductions have been applied to all HGVs over 3.5 tonnes and to goods no matter how long or short the goods are being carried, this is partly, but not wholly, captured by using tonne kilometres[1];
3) Only one of the alternative modes (rail) is included: coastal shipping (excluding off shore oil related) plays a significant role and, for example, has carried RoRo[2] domestic traffic which mostly relieves the strategic road network.

This report examines these estimates, reaches the following conclusions, and makes recommendations for the next steps in terms of research and policy development.

Conclusions

The transfer of freight from road to rail and water would have a significant impact in terms of reduced environmental and congestion costs[3]. HGV traffic overall could fall by 21%, all vehicle traffic by 5-6% and, in the most congested places, congestion could fall by 15-25%.

However, the impact varies according to the level of congestion, the level of longer distance goods traffic, and the capacity of alternatives.

[1] This allows for the higher average distances by rail but not for rail growth tending to be from above average distance loads

[2] RoRo = Roll On Roll Off – in other words wheeled vehicles or vehicle trailers. Unitised goods which have to be lifted on and off are referred to as LoLo

[3] These costs are already recognised in the DfT's own Mode Shift Benefit (MSB) values

In some road corridors there is a much higher likelihood of goods traffic being transferred, and a higher than average proportion of the heaviest HGVs in the traffic flow. This could increase the reduction in total traffic flow to around 10%, with a 30-40% reduction in congestion in the most congested places.

In targeting some of these flows there would need to be structural investment in the alternative networks as well as individual grants as at present.

Recommendations

Research

R1 There needs to be a greater understanding of LGV traffic, including:

- Substitution for smallest rigid HGVs (3.5 to 7.5 tonne)
- Split between servicing, home deliveries and goods transport

R2 There needs to be better understanding of how HGV traffic on different sections of the road network would be affected by:

- a distance based Lorry Road User Charging system (similar to those spreading through Europe) for the heaviest HGVs
- increased congestion and changes in regulation, and thus higher costs

R3 The reasons behind the non-recovery of coastal shipping after the recession and continuing fall need to be identified.

R4 The impact of freight transfers should be included in DfT forecasting and scenarios, for example updating the 2009 DfT/MDS study to reflect the new market conditions (including unitisation) and a national freight model run to test the impact of an LRUC system based on distance and vehicle type.

Policy

P1 A new freight policy statement should be prepared recognising the significant role of mode transfer in reducing congestion on key parts of the strategic road network, and setting out a route map for rebalancing the freight transport market.

P2 There should be consideration of converting the current "electronic vignette" system for charging HGVs to a GPS/tachometer system using weight, distance, and vehicle quality parameters similar to those already proven to be effective in Europe, for example Switzerland and Germany.

P3 There should also be consideration of new weight and size limits in the context of full pricing and providing better vehicle specialisation.

1 Introduction and sources of data

This piece of research addresses a key issue for freight transport and road capacity: whether the use of alternatives to road freight could create a noticeable reduction in congestion. The key to understanding this issue is to separate out the national average picture across all road types from the impact on the most heavily used roads where congestion occurs. In addition, it is important to separate out the activity of the largest goods vehicles from those which are undertaking local deliveries and are less likely to be replaced by modes such as rail or water.

Thus the use of national averages has created an assumption that actions which change patterns of transport demand do not have a significant impact on strategic national networks. The National Policy Statement contains the following statement:
"In general, the nature of some journeys on the Strategic Road Network means that there will tend to be less scope for the use of alternative transport modes. If rail use was to increase by 50% (in terms of passenger kilometres) this would only be equivalent to a reduction of 5% in all road use. If freight carried by rail was to increase by 50% (in terms of tonne kilometres) this would only be equivalent to a reduction of around 7% in goods carried by road."

The statistics in this statement are of course correct when average figures for all road freight are used, but there are three important qualifications:

4) They do not apply uniformly across the road network – some parts of it have more HGV traffic than others, and in particular more goods which could be carried by other modes, for example to and from the ports;
5) The reductions have been applied to all HGVs over 3.5 tonnes and to goods no matter how long or short the goods are being carried, this is partly, but not wholly, captured by using tonne kilometres[4];
6) Only one of the alternative modes (rail) is included: coastal shipping (excluding off shore oil related) plays a significant role and, for example, has carried RoRo[5] domestic traffic which mostly relieves the strategic road network.

In attempting a more detailed, granular approach to the potential impacts there are a range of challenges. First, the data for freight is now available from both national sample counts and the annual Continuing Survey of Road Goods Transport (CSRGT). These are collected rather differently and do not show entirely compatible total flows. For example, the counts include foreign vehicles while CSRGT is for GB registered vehicles only. However, the count data does not provide information on tonnes or tonne kilometres whereas CSRGT does.

At the same time, very little is known about the light goods vehicle (LGV) sector (under 3.5tonnes) - even the proportion of it which is used to provide services (such as repairs, small scale building work) and how much is used to provide the delivery of goods (to home, business or depots). This is important because LGV use has grown hugely in recent years and is forecast to continue to grow strongly. DfT is undertaking work to obtain more data on the LGV sector, to be published later this year (2015).

[4] This allows for the higher average distances by rail but not for rail growth tending to be from above average distance loads

[5] RoRo = Roll On Roll Off – in other words wheeled vehicles or vehicle trailers. Unitised goods which have to be lifted on and off are referred to as LoLo

The tightening of the regulatory framework for HGVs and the availability of larger LGVs just outside the HGV weight limit means that this needs to be explored in some detail to understand exactly what has been happening. It is of course still possible that there has been some under reporting of smaller HGVs in the CSRGT. This is related to the major changes which have taken place in the balance of vehicle kilometres between the different sizes and types of HGVs, particularly in the traffic from smaller rigid HGVs.

Table 1.1: Million vehicle kilometres by gross vehicle weight

Rigid vehicles	**2003**	**2007**	**2013**
Over 3.5 to 7.5	4,319	3,613	2,443
Over 7.5 to 17	2,372	1,307	766
Over 17 to 25	1,916	2,728	2,046
Over 25	2,591	3,220	2,683
All rigids	**11,199**	**10,868**	**7,938**
Articulated vehicles	**10,968**	**11,032**	**9,275**

Source: DfT Stats Table RFS0109, CSRGT

Secondly, the new Road Traffic Forecasts (RTF) published in 2015 contain LGV and HGV forecasts, aiming to predict growth up to 2040 and are useful for considering future congestion and how that might be avoided. However, they use a modelled base year (2010) which for HGV kilometres is between CSRGT and the counts, and are not designed for detailed study of goods vehicle use. The national DfT forecast for both LGVs and HGVs is simpler than that for cars and driven mainly by economic growth and fuel cost[6].

Finally there has been some very detailed multi-modal corridor work undertaken in 2009 by DfT and MDS Transmodal, who run the national freight model. This has excellent detail on flows by commodity and type (domestic, RoRo, LoLo), length of haul and which part of the road and network is used. Unfortunately this used slightly older data so recent, post-recession patterns of transport are not available. However, this work is still useful being used by DfT and others. It identified important trends such as the move to unitisation, making freight easier to handle across modes or for point to point journeys by rail.

This research uses the latest CSRGT figures, published DfT data for freight by all modes, the published spreadsheets underpinning the new RTF and the 2009 MDS Transmodal study both to review the national average impact of mode transfer, and some corridor impacts for road to rail transfers.

While it is possible to be fairly confident about the impact on tonne kilometres it is more difficult to translate these into a full impact assessment by:

1) transforming tonne kilometres into vehicle kilometres,
2) estimating their impact on traffic (since they occupy much more road space than cars), and
3) estimating their impact on congestion, since in congested conditions each single percent increase in traffic causes a several percent increase in congestion.

An estimate has been made to identify the scale of this overall impact.

6 See RTF 2015 paras 3.28-3.29 and Figures 3.7 and 3.8

2 National level reductions targeting long distance freight in larger HGVs

While the National Policy statement, that rail freight can only have a small impact on overall road flows, is correct in overall terms, it is based on average figures for tonne kilometres. The use of tonne kilometres means that account is taken of the difference in average journey length between road and rail. In 2013 this was 94kms for road, 195kms for rail[7]. However, it does not take into account that some of the increase in rail freight is likely to be longer than average, for example there are many road journeys over 300kms (19% of all road freight tonne kms). The full split by distance is shown below.

Table 2.1 Tonne kilometres by length of haul (kilometres) all HGVs 2013

	Up to 25	Over 25 to 50	Over 50 to 100	Over 100 to 150	Over 150 to 200	Over 200 to 300	Over 300	All lengths
Tonne kilometres	5,114	11,072	23,068	21,721	20,009	32,096	26,143	139,224
% of total	***4***	***8***	***17***	***16***	***14***	***23***	***19***	***100***

Table 2.2 Tonne kilometres by length of haul (kilometres) HGVs 4 axles and above

	Up to 25	Over 25 to 50	Over 50 to 100	Over 100 to 150	Over 150 to 200	Over 200 to 300	Over 300	All lengths
Tonne kilometres	4,337	9,696	20,272	19,616	18,529	30,301	25,296	128,047
% of total	***3***	***8***	***16***	***15***	***14***	***24***	***20***	***100%***

Source: DfT statistics Table RFS 0127

The low amount of goods transport undertaken on short distances perhaps reflects the fall in the use of small HGVs discussed in the previous section and set out in Table 1.1.

Unfortunately the equivalent vehicle kilometre data is not available, although the implication is that changes in tonne kms will be reflected in vehicle kms. Of course HGV traffic is a relatively small proportion of vehicle kilometres – even on the strategic network (Motorway and Trunk A roads) it is about 10.2% on average, 10.9% on motorways. However, this is not uniform as will be seen in the later section on corridors.

In addition, the largest HGVs are very different in terms of size and handling characteristics from other road vehicles such as cars. They obviously need more road space than cars and this is measured as car equivalents or passenger car units (pcus). Historically this has been set at an average of 2.5 for motorways and all purpose dual carriageways, and somewhat surprisingly 2.0 for other roads[8]. Some freight modelling uses 2.9 for the largest HGVs. Given the larger numbers of HGVs and the fact that the fleet is concentrated at the heaviest end, together with the consistent increases in size and weight over a number of years, these figures are probably an underestimate[9] and should be revised upwards. The impact of pcus on congestion is discussed later in this report.

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7 TSGB Table 0401 for 2013, updated with 2013/14 rail. There is a problem in that the statistical series for rail and road have slightly different year ends

8 TAG Unit M3.1 Highway Assignment Modelling, DfT, January 2014

9 *Heavy Goods Vehicles - do they pay for the damage they cause?* MTRU Report June 2014

Rail impact

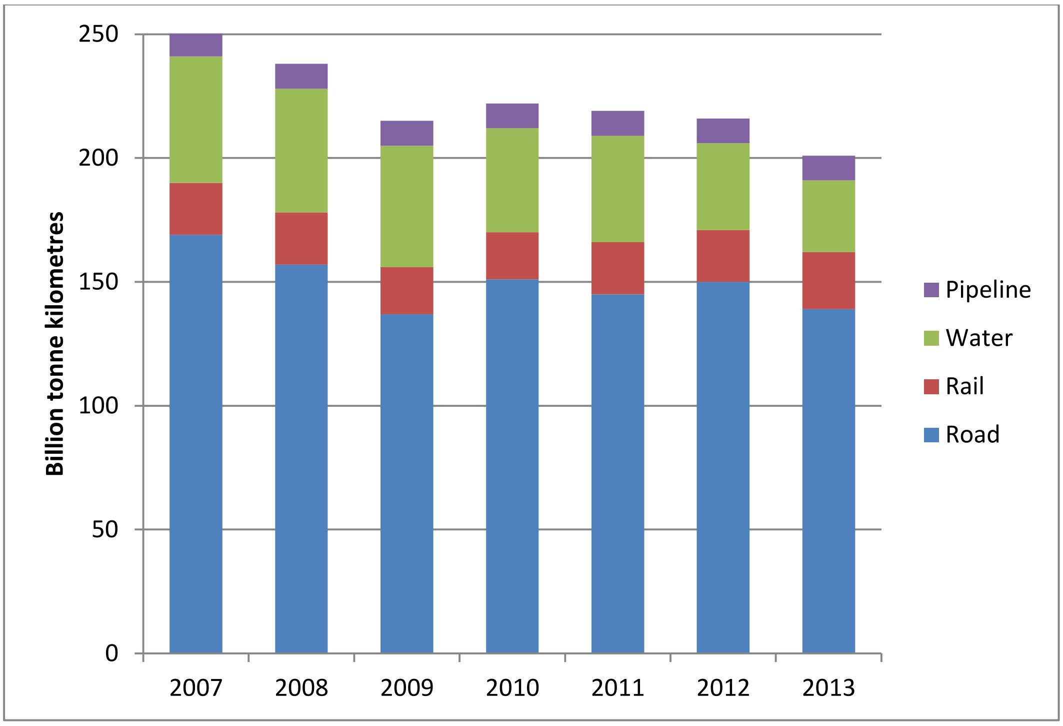
The first task for this study was to replicate the NPS calculation for a 50% increase in rail freight and arrive at its figure of 7%. This was done (7.2%) and showed that the average distances had been used, based on all HGVs, which thus included smaller rigid vehicles, for example from 3.5 to 7.5 tonnes gross vehicle weight. These are likely to be being used for final distribution of goods, for example to shops, although some large articulated HGVs are also used for retail deliveries, for example by supermarkets. Rail is obviously not competing for such traffic.

The next step was to rerun the calculation but focussing the increase in the longer distance category, in this case applying the 50% increase in rail to journeys over 200 kms. This resulted in a revised figure of 12% reduction in road tonne kms instead of 7% using the NPS method[10].

Other modes

As can be seen from the chart below, rail is not the only alternative for road freight. Pipeline is a specialised mode so has not been considered for this report. However, there have clearly been some major changes in the use of coastal shipping, which can provide another alternative means of transport. This need not be direct port or depot to factory or regional distribution centre, the use of Roll On Roll Off coastal ferries is an important example. Given that access to the coastal network is so much less than rail, only the longest hauls are suitable. This is reflected in the average distance for freight moving by coastal shipping at 319 kms.

Figure 2.1 Share of GB tonne kilometres by mode



Source: DfT statistics Table TSGB0401

Undertaking a parallel calculation to that for rail would show the potential for a further reduction through transfer to water of 9.3%. Thus a 50% increase in both of the two plausible alternatives to

10 This appears to have used the annual rail freight statistics for 2012/13

road for longer distance freight transport would result in a reduction of 21% in road freight tonne kilometres and by implication a 21% reduction in the vehicle kilometres from the largest HGVs. There may be some competition between rail and water which would diminish this number, although as can be seen from the chart in 2007, immediately preceding the recession, water carried 76% more freight than in 2013. One of the recommendations in this report is that this phenomenon should be researched to understand why there appears to have been such a low recovery, and indeed continued decline.

As mentioned previously, HGV traffic is only part of overall traffic, an average of 10.2% on the strategic network of major A roads and motorways. Thus a 21% reduction in HGV traffic from the rise in rail and water gives a first estimate of a 2.3% reduction in vehicle kilometres on the strategic road network (1.3% for rail only transfers).

However, as set out earlier, there are three important factors which need to be included to achieve a more accurate picture of the impact of HGVs on congestion:

1) they occupy considerably more road space as cars (have a high pcu value)
2) the average figures disguise the more significant impacts where HGVs are a higher proportion of traffic
3) the impact of additional traffic in already congested conditions is far greater than a simple increase in pcu or vehicle kilometres suggest – it rises exponentially.

The issue of how these factors influence the HGVs' impact on congestion is explored in the next section of this report.

3 Tonne kilometres, vehicle kilometres and congestion

Implications for vehicle kilometres and congestion

While the combined impact on road freight from increasing use of alternative modes may reduce tonne kilometres from HGVs by just over 20%, the key question for transport planners is how far such policies would contribute to relieving congestion. To understand this there are two important considerations:

1) The amount of extra road space occupied by HGVs compared to cars (translating vehicle kilometres into passenger car units or pcus)
2) The fact that in congested conditions an extra unit of traffic (pcu kilometre) causes several times its unit value in terms of added congestion.

The pcu value of HGVs

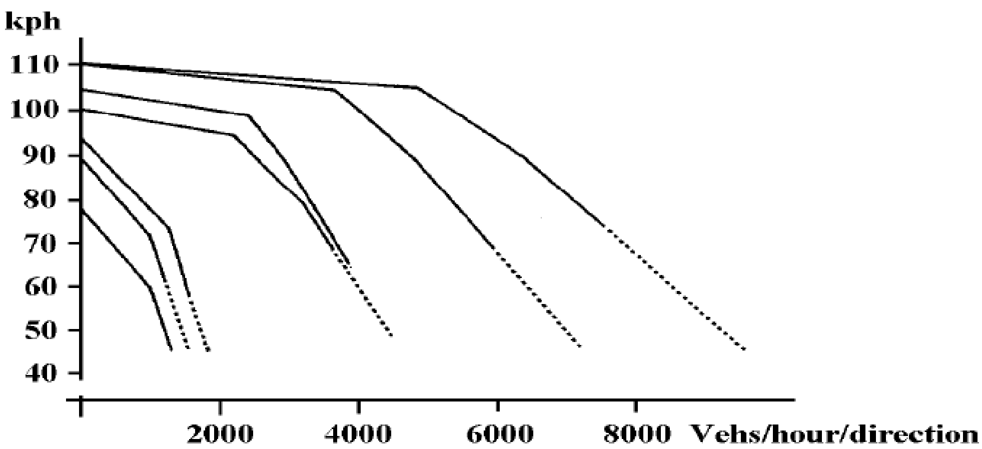
Currently HGVs over 3.5 tonnes gvw are given a pcu value of 2.5. In reality, this value changes dramatically between the different HGVs, for example 44 tonne artics and 3.5 tonne rigids. It also changes dramatically between road type and level of congestion. A figure of 2.9 is often used for artics, which are the vehicles most likely to be affected by any mode transfer.

Using the adjustment of 2.9 (and rebasing to reflect the new total pcu kms), the total amount of traffic which would be removed from the strategic network would not be 2.3% (as quoted earlier in vehicle kms) but 5% of the total pcu kms, which is the more accurate measure of road traffic demand. At a pcu value of 4, it would be a 6% reduction in pcu kms. The equivalent figures for rail only transfers are 3% and 5% respectively.

The differential impact of congestion

The final issue is the question of how congestion increases rapidly with additional traffic flow, and how often HGVs are present in congested conditions. Without running a national traffic model it is hard to produce precise figures. However there are several sources which can illustrate the issue: traffic modelling generally assume non-linear decreases in speed (i.e. congestion), there are some DfT statistics and marginal cost calculations for different levels of congestion, and the recent RTF which modelled the impact of increased traffic on the strategic road network. The original speed flow curves used in the UK were developed for the DfT's COBA programme, illustrated below.

Figure 3.1 COBA 10 speed versus flow curves



The DfT measures of congestion have taken different forms, currently looking at numbers of journeys completed on time. For this reason the time series is interrupted in recent years, and there is also considerable volatility. However, the DfT congestion indices during the recession[11] indicated that a modest decrease in traffic (around 2%) resulted in the congestion measure falling by 10%. However there is great deal of variation in the data from year to year. Another DfT source for the relative impact can be seen in the Webtag Data Book[12]. This shows a rapid escalation in the external cost of congestion per car kilometre.

Table 3.1: Increasing cost of additional car traffic at different levels of existing congestion

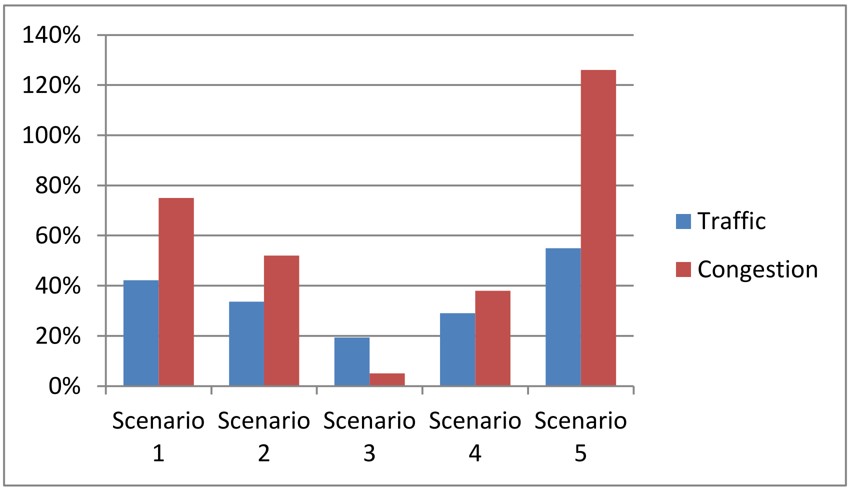
Congestion level (1 is low, 5 is high)	**Weighted average** (pence per car km all road types)
1	**1.2**
2	**2.8**
3	**9.9**
4	**87.6**
5	**155.0**

Source: WebTAG Data Book Table A 5.4.2

It must be noted that this reflects the rapid increase in the number of vehicles affected as well as the increase in absolute delays. A parallel approach is used in the DfT calculation of marginal external costs for articulated vehicles[13], which includes a range of external costs including congestion. This assumes that the heaviest HGVs cause four times the congestion costs on a motorway with high congestion than one with low congestion.

Further work for the national RTF has provided another measure of changes in congestion (again not the same as the examples previously quoted). This is illustrated by the chart below, which shows traffic increases and the relative impact on how much of that traffic is in congested conditions.

Figure 3.2 Increases in traffic and congestion to 2040, RTF 2015, all modelled roads



Note: Assumes road capacity increases as per Road Investment Strategy

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11 Table CGN0101: *Average vehicle delay on the slowest 10% of journeys on the Strategic Road Network*
Table TRA 0201: *Motor vehicle traffic*

12 See https://www.gov.uk/government/publications/webtag-tag-data-book-november-2014

13 *Mode Shift Benefit Refresh:* DfT December 2014

The five scenarios are for different levels of traffic growth on different parts of the network and are include for completeness. The forecast assumed that significant road investment was made, hence some traffic increase is accommodated with small increase in congestion.

Even using a simple multiplier of 3-4 to reflect the much higher congestion cost of an added pcu kilometre, in the busiest parts of the road network congestion could be reduced by 15-24% by increases in use of rail and water. Rail alone could result in 9-14% reductions in congestion.

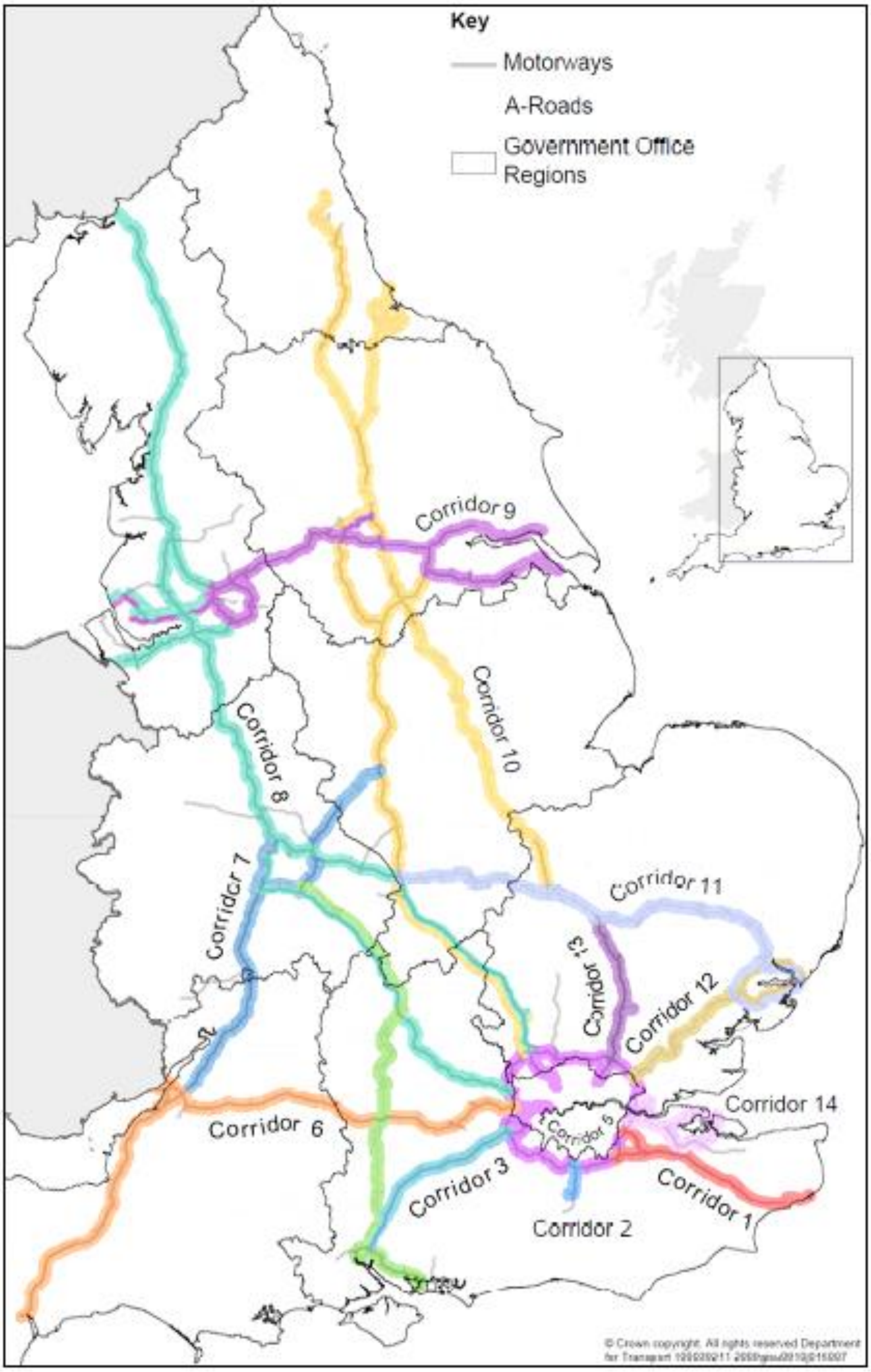
In addition, the level to which congestion is decreased by mode transfer will be higher depending on how fast traffic overall is growing. In other words, as traffic grows the network as a whole becomes more sensitive to small changes. This fits entirely with traffic flow theory, in which speed flow curves (see Figure 3.1 above) show relative insensitivity at low flows, rising rapidly as both flow and congestion increase.

Thus, while overall figures for changes in tonne kilometres give an indication of the national impact across all parts of the network, it may not reflect the road space requirements of the largest HGVs nor their increasing impact on congestion. It is thus important to identify where some of the mode transfers are most likely to occur, and what traffic congestion is like on those corridors. This is considered in the next section of this report.

4 Key corridors and the variation in potential benefits

In 2009 DfT commissioned a report from MDS Transmodal, who run their national (GB) freight model. This contained a very detailed analysis of goods transport for 14 corridors, shown below.

Figure 4.1 MDS Transmodal study road freight corridors



The MDS/DfT study contained an analysis of pcu kilometres by HGVs, journey distances and split between domestic and international traffic. There was also an analysis of congestion on a corridor by corridor basis. Some of the data is older than the study date, but there is no subsequent update available. The results are still being used for transport scheme modelling (such as the A14 study). However, there is more up to date information on where congestion is occurring on the road network, and where it is predicted to occur in future, in the 2015 Road Traffic Forecasts (RTF).

The individual corridor information has been extracted and summarised, and combined with the RTF congestion maps, to produce a table which is designed to show where the best candidates for a move to rail are located, and whether they would have an above average impact on road congestion. The RTF maps are based on the AM peak and are shown in Annex 1 and the table is set out on the following pages.

The conclusion to be drawn from this is that there is considerable variation between the corridors, and even within them. The analysis throws up examples of where the impact of reducing HGV traffic could be greatest and most effective in reducing congestion, and where further work might be needed to be certain of the impacts.

Given that the average potential reduction in total traffic (as pcu kms) calculated earlier was about 5-6%, corridors with a higher than average proportion of HGVs would be expected to show higher reductions in overall traffic and congestion. In addition, the impact of a generalised increase of 50% in rail freight would be higher where there is a greater proportion of international or long distance traffic.

Thus it is the case that the 50% increase in rail or water freight would not be evenly distributed. In some areas it is possible that only 25% would be achieved, in others perhaps 75%. Assuming an uplift to 75%, reductions of 9% in total traffic on the strategic network would be possible[14], with even higher reductions in congestion[15] three to four times this figure (up to a third reduction) in the most congested sections of the network. In these circumstances transfers to rail alone could reduce congestion by 14-20%.

To summarise the results of these re-estimates based on the identified corridors, on a section of the strategic road network where there is more than average flows of HGVs and the ability of the alternatives particularly competitive, the reduction in congestion could be dramatic. Cells in the table have been highlighted to illustrate where these conditions might occur. These can then easily be cross referenced to check congestion levels from the RTF.

For example, Corridor 1 (Dover) has higher than average lengths of haul, higher than average proportion of HGVs and of international traffic. The road network suffers some areas of the highest congestion type. It is clearly a section of the network where mode transfer is likely to have a far higher than average impact.

Overall it is clear that there are a group of corridors which have double the average HGV flows and a higher than average propensity for transfer. Examples would be the ports related corridors: 1, 4, 7,

[14] At 25% the figure would of course be less, at about 3%

[15] A congestion multiplier of 3 to 4 can be used to illustrate this point but it must be noted that, in the same way that traffic congestion escalates rapidly, the amount by which congestion is reduced also decreases in absolute terms as the overall level of congestion decreases. Thus the multiplier rises exponentially with traffic increases in congested conditions, but falls in the same way as traffic falls.

9, and 11; and the long distance motorways: 8, 9 and 10; and the South East and centre North sections of the M25.

Overall, within the general sweep of a 50% increase in rail or water freight, it is clear that substantial improvements could be achieved in some of the most congested parts of the strategic road network.

Table 4.1 Corridor Analysis

Based on MDS Transmodal 2009 corridor reports and 2015 RTF maps for am peak congestion.

***RTF Categories are*: 1 occasional; 2 moderate; 3 regular; 4 severe.**

Corridor	Haul length kms	% total traffic pcus Blue indicates >average	% domestic	Congestion 2010 AM Peak	Congestion 2040 AM Peak
1: Dover to M25	Average >300 at SE end 150-200 at M25	30-40	10 (SE end) to 50 (M25 end	Mostly category **1** Occasional **3** & **4**	About half category **2**, frequent category **3** & **4**
2: London to Gatwick	N/A	13	80	Even split categories **2** & **3**	All category **3**
3: London to Southampton	150 10%>300	18-25	70-80	Mostly category **2** with **3** & **4** at each end[16]	Mostly category **3** with **4** at each end
4: Southampton to the Midlands (A34-M40)	Average 150-200 25%> 300	25-30	70-80	Even split categories **1** & **2** with **3** & **4** near Southampton	Even split categories **2** & **3** with **4** at Southampton
5: London orbital M25		E & N sections: 30-35 S: 25, W: 20	E & N 40-65 S 70, W 80-90	S & SW mostly category **3**, rest mostly **2**	S & SW mostly category **4**, rest mostly **3**
6: London to SW & Wales	E of Reading 100-150 W of Reading 250-300	E of Reading 18 W of Reading 22 M5 to Exeter 25	E of Reading 90 W of Reading 75-80	E of Reading mostly **3** W of Reading mostly **1**, occasional **2**	E of Reading **3**, occasional **4**, W of Reading mostly **2**, occasional **3**
7: Bristol to the Midlands	250 overall 200 close to B'ham	M5 25-28 M42 E of B'ham 25-30 M42/A42 30-35	85-90	Mostly category **1** Occasional **2** & **3** close to & approaching B'ham	Mostly category **2** N & S of B'ham mostly **3** & **4** close to & approaching B'ham
8: London to W Midlands, N Wales, NW & Scotland including both M1 & M40 routes S of B'ham	Close to conurbations (London, B'ham, NW) 150 Intercity 250-300	M1: 30-36 M40: 20-30 M6: 35-45	M1: 70 M40: 90 M6: S of M62: 70-75 M6: N of M62: 90	M1[17]: Mostly cat **2** M40: Even split **1** & 2 M6: S of Preston mostly cat **2**, occasional **3** & **4** around Manc, B'ham M6: N of Preston: Cat **1** throughout	M1: Even split **2** & **3** M40: Even split **2** & **3** M6: S of Preston split **2** & **3**, some **4** around Manc, B'ham M6: N of Preston: Mostly cat **1**, some **2**

16 Southampton end overlaps Corridor 4

17 A5 parallel route is more congested but more urban and not included in the MDS study

9: Transpennine: Liverpool to Kingston and Grimsby	Western 100 Eastern 150	25-30	90 But higher than average bulk commodities	Eastern end to A1: cat **1** Close to L'pool: split **1** & **2** A1 to M6: split 2 & **3** occcasional **4**	Eastern end to A1: cat **1** Close to L'pool: cat **1** A1 to M6: All **3** apart from **4** around conurbations
10: Flows from London area to E Midlands, Yorkshire, NE & Scotland, network studied from A14 Northwards including both M1 and A1	A1 to York 250-300 Close to conurbations 150-200	M1 to Sheffield: 30-35 A1 M to York: 35-45 A1 (M) N of Leeds 25-35	90 Large number of distribution centres: especially RDC/NDC Milton Keynes to Leicester; RDC Leeds, W'field, Teeside	A1: Mostly cat **1** apart from **3** & **4** N of Doncaster & N of Leeds M1 mostly cat **2**, cat **3** N of A38 S of Newcastle: Stretches of **2**, **3**, **4**	A1: Even split **1** & **2** apart from **4** N of Doncaster and **3** & **4** N of Leeds M1 mostly cat **3** N of A38 S of Newcastle + N of Leeds: Mostly **2** & **3**
11: Haven ports to the Midlands (A14)	200-250 Ports to Bury St Edmunds 25%>300 Newmarket to Kettering 25-35 > 300	35-40 throughout	Ports to Bury St Edmunds 60-65 Newmarket to Kettering 75	Various short sections of cat **1** and **2**, cat **4** at Ipswich, Bury St Edmunds, junction with A10 and at Huntingdon	Mostly cat **3** with some cat **2** and cat **4** at Ipswich, Bury St Edmunds, NW of Cambridge and at Huntingdon
12: Haven ports to London (A12 Ipswich to M25)	150-200	20-24	50	Mostly cat **3** & **4**	Mostly cat **4** with about a third cat **3**
13: London to Stansted corridor	250-300	30-32	70-75	Cat **1**, cat **2** at junction with A14	Even split cat **1** & **2**, cat 3 at junction with A14
14: Thames Gateway to London (A13 N of Thames, A2/M2 South	100-150	20-25	A13: 50-75 A2/M2: most (figure not given)	A13: Cat **1**, **4** at M25 A2/M2: Cat **2**, short sections **3**, one of **4**	A13: Cat **1**, **4** at M25 A2/M2: Cat **3**, junction of A2/M2 cat **4**, approach to M25 cat **4**

5 Conclusions and recommendations

Conclusions

The transfer of freight from road to rail and water would have a significant impact in terms of reduced environmental and congestion costs[18]. HGV traffic overall could fall by 21%, all vehicle traffic by 5-6% and, in the most congested places, congestion could fall by 15-25%.

However, the impact varies according to the level of congestion, the level of longer distance goods traffic, and the capacity of alternatives.

In some road corridors there is a much higher likelihood of goods traffic being transferred, and a higher than average proportion of the heaviest HGVs in the traffic flow. This could increase the reduction in total traffic flow to around 10%, with a 30-40% reduction in congestion in the most congested places.

In targeting some of these flows there would need to be structural investment in the alternative networks as well as individual grants as at present.

Recommendations

Research

R1 There needs to be a greater understanding of LGV traffic, including:

- Substitution for smallest rigid HGVs (3.5 to 7.5 tonne)
- Split between servicing, home deliveries and goods transport

R2 There needs to be better understanding of how HGV traffic on different sections of the road network would be affected by:

- a distance based Lorry Road User Charging system (similar to those spreading through Europe) for the heaviest HGVs
- increased congestion and changes in regulation, and thus higher costs

R3 The reasons behind the non-recovery of coastal shipping after the recession and continuing fall need to be identified.

R4 The impact of freight transfers should be included in DfT forecasting and scenarios, and thus in its policymaking and spending programmes, for example updating the 2009 DfT/MDS study to reflect the new market conditions (including unitisation) and a national freight model run to test the impact of an LRUC system based on distance and vehicle type.

Policy

P1 A new freight policy statement should be prepared recognising the significant role of mode transfer in reducing congestion on key parts of the strategic road network, and setting out a route map for rebalancing the freight transport market.

P2 There should be consideration of converting the current "electronic vignette" system for charging HGVs to a GPS/tachometer system using weight, distance, and vehicle quality parameters similar to those already proven to be effective in Europe, for example Switzerland and Germany.

P3 There should also be consideration of new weight and size limits in the context of full pricing, providing better vehicle specialisation, and better planning for multi-modal freight facilities.

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18 These costs are already recognised in the DfT's own Mode Shift Benefit (MSB) values

Annex 1: Congestion maps from the 2015 RTF (pages 71-72)