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**Appropriate Indicators of Rail Freight Activity and Market Share: A Review of UK  
Practice and Recommendations for Change**

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**Abstract**

Growth in rail freight activity features strongly in contemporary transport policy at both the United Kingdom (UK) and European Union (EU) scale. Specifically, the British government set an 80 per cent growth target between 2000 and 2010, with lower (but still substantial) growth estimates being identified in late-2005. This paper assesses the appropriateness of the forms of measurement adopted for rail freight activity and argues that achieving stated growth targets or estimates will not necessarily mean that policies encouraging modal shift from road to rail have succeeded. Additional or alternative means of monitoring the level of rail freight activity are discussed, since this is an issue of fundamental importance to policy implementation and evaluation.

Keywords: Rail Freight, Mode Share, Policy Evaluation, Transport Indicators

## 1. Introduction

This paper is intended to generate discussion of the way in which rail freight activity is typically measured, particularly in the context of the growth target that was set within the British government's Ten Year Plan (DETR, 2000a) and the more recent growth estimates resulting from modelling work conducted in 2005 (RFG, 2005). Rail freight has received greater attention in recent years for a number of reasons, including the privatisation of the industry in the 1990s, the increasing challenges facing the road haulage sector, problems within the rail industry, and changes in government policy, which have become more focused (in some respects at least) upon the issues of "sustainability" and "integration". A specific target for rail freight growth was set for the first time, though there was little by way of justification of either the target growth or the units of measurement. At the broader European level, the European Union's 2001 Transport White Paper (European Union, 2001) also set a growth target for rail freight. This paper seeks to identify the issues surrounding the forms of measurement in particular, through discussion and analysis of the ways in which freight activity are measured and the changes that have been taking place in the rail freight sector. It is not the intention to analyse the progress, or otherwise, being made towards meeting the target, but rather to consider the appropriateness of targets such as those that exists. The paper concludes with recommendations for policy makers as to the most appropriate means of measuring the degree of success of policies designed to influence freight mode share.

For many years, indeed going back at least as far as the early-1950s, two forms of measurement of rail freight activity have been published in British statistics, these being tonnes lifted and tonnes moved. The former is a straightforward measurement of the number of tonnes being loaded onto rail wagons at the start of their journey, while the latter also takes into account the distance travelled by those goods and is measured in tonne kilometres. While inconsistencies between modes and over time cannot be ruled out due to changes in data collection methods, an undoubted benefit of these forms of

measurement is that they are simple and are published at least annually, thus allowing inter-modal and time series analysis of activity levels, mode share, etc. Of the two measurements, that of tonne kilometres tends to be more dominant given that it incorporates the distance element of the freight movement. The amount of freight activity generated by 10 tonnes of product will be very different dependent on whether the product is moved over a distance of 50 kilometres or 500 kilometres; the wider impacts of such a variation in the length of haul will also be significant, all other things being equal. While the focus of this paper is on rail freight activity within Great Britain, the issues are relevant to the use of targets more generally within the transport sector.

## **2. Target-setting within public policy**

Targets have become a more significant component of government policy in recent years, particularly in Great Britain. It is the British government's view that:

“Targets provide a clear statement of what the Government is trying to achieve. They set out the Government's aims and priorities for improving public services and the specific results Government is aiming to deliver. Targets can also be used to set standards to achieve greater equity” (PASC, 2003).

The Government's five aspirations for its targets are that they should provide a clear statement of what the Government is trying to achieve, a clear sense of direction and ambition, a focus on delivering results, a basis for what is and is not working, and better accountability. However, the application of targets has attracted considerable negative publicity. Concern about their use was expressed by the Leader of the Opposition in the House of Commons in 2003, with the motion that “this House notes the abject failure of the Government to meet its targets for delivery on public services; believes the current public service agreement regime to be deeply flawed; is concerned in particular that the volume of targets and their rigid and centralised structure have stifled local initiative,

diminished professional responsibility, distorted priorities and diverted time and attention away from the task of improving public services; [and] regrets that the Government has used targets as a substitute for real reform” (Hansard, 2003). The motion was defeated, but highlights the concern relating to target setting. The PASC (2003) identified potential discontinuities between the “measurement culture” that resulted from target-setting and the “performance culture” which is the positive force for change. In essence, the focus on crude targets rather than overall standards can be seen to have a negative effect on performance. This has been recognised by the government, which has reduced the number of public service targets from 250 to 110 between 1998 and 2004 (Guardian, 2005b). There is a growing awareness that narrow targets may result in the “bigger picture” being lost, or may lead to changes in the way that statistics are calculated and/or presented so as to seem to be meeting targets, the overall result being a loss of flexibility which may lead to lower overall success in a particular policy area. By way of example, Table 1 presents a range of targets that have been applied in various different areas of public sector interest and highlights the alleged negative consequences associated with each of the targets shown. This list is not intended to be comprehensive, but is indicative of concerns about the focus on specific targets at the expense of wider issues.

*(Insert Table 1 around here)*

In the academic literature, considerable attention has been devoted to sustainable mobility indicators and their measurement though most has been focused on the movement of people rather than freight. For example, Nicolas *et al.* (2003) consider environmental, economic and social indicators in the context of local passenger movements within the Lyon conurbation, while Jones and Lucas (2000) consider at the strategic level the extent to which there is ‘joined-up’ policy thinking both within the transport area and between transport and other policy areas related to sustainable development. In the freight sector, several Key Performance Indicator (KPI) benchmarking studies have been carried out in various sub-sectors, some of which (e.g.

McKinnon *et al.*, 2003) have considered the appropriateness of different units by which freight activity can and should be measured. This is returned to later in the paper. It is within the context of policy intervention and target-setting that the nature of rail freight targets and growth aspirations is assessed, and the ways in which activity levels are measured is analysed.

### **3. Current rail freight policy**

In an attempt to further the policy agenda, and to deal with problems within the rail industry, government policy documents have been appearing at a rapid rate since the late-1990s. While there has not always been consistency of approach, there appears to be an expectation that rail should, and indeed will, play a greater role in the future than it is doing at present. It is not always clear, however, how individual elements of the transport strategy should best be pursued to achieve the stated objectives, not least in the freight sector.

Following the privatisation of British Rail in the mid-1990s under the 1993 Railways Act, in particular the transfer both of Railtrack and freight operations to the private sector in 1996, government interest in rail freight was very limited. At privatisation, English Welsh and Scottish Railway (EWS) gained control of five of the six rail freight businesses; Freightliner, the sixth, was sold to a management buyout team. A detailed account of the rail privatisation process, including the transfer of freight operations to the private sector, can be found in Freeman and Shaw (2000).

The change of government in May 1997, when Labour replaced the Conservatives, heralded a change in approach towards transport, with less of an emphasis on competition and more on integration and sustainability. The 1998 Integrated Transport White Paper (DETR, 1998) was the first policy document to reveal this new approach, stating that the government believed that more freight could and should be moved by

rail. The White Paper endorsed the ambitious growth targets of the two operators at the time, which were as follows:

- EWS - doubling of rail freight activity, as measured in tonne kilometres, in five years and tripling it in 10 years, subsequently downgraded to a doubling in 10 years (CfIT, 2002)
- Freightliner – 50 per cent increase in containers carried in five years (Anon, 1996)

The 1998 White Paper argued that, should the targets be met, road tonne kilometres could be 10 per cent lower in 2010 than forecast. There was a caveat, however, that the proposed Strategic Rail Authority (SRA) would need to balance the requirements of passenger and freight customers in the development of any official government targets. The operator targets were carried through in government policy into the Sustainable Distribution daughter document (DETR, 1999), though with the same caveat. Government policy towards rail freight was formalised within the Ten Year Plan (DETR, 2000a), where a new, specific target was set; two questions arise from this:

- *What exactly is the target that was set for rail freight?* The Ten Year Plan established the target of an 80 per cent increase in rail freight tonne kilometres by 2010. According to the SRA (2004), the base year for the Ten Year Plan is 2000/01; it appears that the target year is 2010/11, although some references are made in government documents to 2009/10 or 2010.
- *What precisely did the target mean?* Delving beneath the headline target reveals that the target does make some attempt to incorporate anticipated growth in general freight volumes during the ten year period. The Ten Year Plan itself assumes that, in meeting the target, rail would carry an additional 15 billion tonne kilometres giving it a 10 per cent market share by 2010 as opposed to 7 per cent at the start of the period. Somewhat contradictorily, however, the background analysis to the Ten Year Plan (DETR, 2000b) was based upon an

increase in rail's mode share from 7 per cent of freight moved to 11 per cent. Of note is that total freight activity, measured both by number of journeys and length of haul, was assumed to increase in line with the predicted economic growth over the 10 year period, rather than remain static.

In many respects, the detail relating to the second of these questions is not particularly important; the target incorporates an expectation of an increase in rail's share of the market, even if this has not been made explicit in the subsequent reporting of the target. The establishment in 2000 of the SRA provided a focus for the development and promotion of rail freight that had been lacking in the immediate post-privatisation era. Indeed, recognising the lack of recognition given to freight, the first detailed strategy document produced by the SRA was its Freight Strategy (SRA, 2001). This document endorsed the 80 per cent growth target, though opined that "the target is undoubtedly more difficult to achieve in the timescale now than when the 10 Year Plan was published.....however, this does not detract from the validity of the Strategy" (p.3).

In developing the Freight Strategy, three scenarios were developed and analysed using demand models developed by two consultants (i.e. MDS Transmodal and Sinclair Knight Merz). Table 2 summarises the growth forecasts for each model and scenario, with the "medium" scenario closely matching the assumptions in the Ten Year Plan and the outcomes for this scenario are in general accordance with the ten year growth target.

*(Insert Table 2 around here)*

The SRA acknowledged that these forecasts assumed that the rail network itself would have the capacity to cope with the increases in demand and further accepted that the models need to be refined. However, the assessment shows that approximately one third of the growth is expected to be in rail's traditional bulk markets, with the remainder



being from “unit loads, premium logistics<sup>1</sup> and new markets” (SRA, 2001a, p.9). This assumption is crucial when considering the relevance of the stated growth target and the way in which it is expressed.

In 2004, rail policy took another new direction with the publication of a further White Paper (DfT, 2004) which proposes fundamental changes in order to streamline the structure of the industry. These changes do not impact upon the ways in which rail freight activity is measured, or on the issues raised in this paper surrounding the validity of such units of measurement. However, the 80 per cent growth target did not feature in the 2004 White Paper and has since been referred to as having been “aspirational” and not necessarily achievable. Despite this, the expectation of rail freight growth remains and was confirmed by the Secretary of State for Transport in July 2005 (Darling, 2005). One outcome of the recent changes to the structure of the industry is that the Department for Transport (DfT) now expects the rail freight industry to develop its own traffic forecasts as an input to the High Level Output Statement that the DfT is required to provide to Network Rail. The forecast growth between 2003 and 2014 is shown in Table 3. It should be noted that these forecasts are expressed in tonnes lifted, rather than tonne kilometres, and the 2003 figure is based on the industry’s own statistics rather than those published by the DfT.

It is clear from the forecasts that the predicted growth is not spread uniformly across the various commodity sectors. Indeed, there is expected reduction in tonnages carried of ores and waste, together with Network Rail’s own haulage for infrastructure maintenance and renewals. The key implication of the forecasts is that “non-bulk” (i.e. maritime containers, Channel Tunnel and domestic intermodal/wagonload) will increase from 13 per cent of commercial freight tonnage (i.e. excluding Network Rail own haulage) in 2003 to 24 per cent by 2014. By contrast, coal’s share is predicted to fall from 44 per cent to 38 per cent in the same time period. Given that non-bulk flows tend to have a higher length of haul than do bulk ones, the likelihood is that non-bulk’s

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<sup>1</sup> The definition of premium logistics adopted by the SRA was “freight with a higher value to weight or volume ratio, usually requiring fast delivery times”

increase in the share of tonne kilometres would be even greater. This is in line with the previous projections that the majority of growth will come from the non-bulk sectors.

*(Insert Table 3 around here)*

Unfortunately there is no readily available way of converting tonnes lifted forecasts into tonne kilometres, as the details relating to predicted flow lengths are not available. It is expected that the forecasting will be revised and enhanced on a regular basis, potentially including more detailed predictions of tonne kilometre changes.

Growth in rail freight transport is also supported at the European level. In its 2001 White Paper (European Union, 2001), a target is set to increase rail's mode share from 8 per cent of tonne kilometres in 1998 to 15 per cent by 2020. It is clear that public policy, at both the British and European levels, is strongly in favour of a greater role for rail freight.

#### **4. Long-term trends in official rail freight forms of measurement in Britain**

Prior to considering the relevance of the freight targets and forecasts, it is worthwhile identifying the key trends in freight movement in Britain. By way of background, Figure 1 shows the freight market share, expressed in tonne kilometres, of each of the modes of transport in selected years since the mid-1980s. During this period, the overall growth in freight volumes was one third, and rail freight's share of the market declined from 8 per cent in 1985 to 6 per cent in 1995 before rising back to 8 per cent in 2003. The overwhelming majority of waterborne traffic is coastal shipping rather than by inland waterway.

*(Insert Figure 1 around here)*

In Figure 2, the 20-year trend in rail freight tonne kilometres is displayed, with the vertical line representing the start point for the Ten Year Plan and its associated growth

target. It is clear from the graph that coal accounts for a significant proportion of the total. In fact its proportion of tonne kilometres was higher in 2004/05 (at 34 per cent) than it was in 1986/87, when it was 30 per cent. This partially reflects a large increase in the number of tonnes lifted in 2004/05 compared to the previous year, but mainly results from a dramatic increase in coal's length of haul on the rail network. This increased from 58 kilometres in 1986/87 to 135 kilometres in 2004/05. Data relating to the other bulk sectors (i.e. metals, construction and oil and petroleum) have been published only since the late-1990s. However, a basic assessment of the bulk share of the market reveals that it has gradually increased its share of total tonne kilometres from 59 per cent of the total in 1998/99 to 66 per cent in 2004/05. More detailed analysis of the recent trends in the non-bulk market can be found in Woodburn (2006), which argues that recent changes in non-bulk activity have not been fully reflected in the tonne kilometre statistics. Section 5 addresses the extent to which the statistics reflect the true nature of rail freight activity.

*(Insert Figure 2 around here)*

It is quite clear, though, that a different picture emerges dependent upon the units of measurement used. While the number of tonne kilometres shows a general upward trend since the mid-1990s, as shown in Figure 2, the number of tonnes lifted essentially dipped from its mid-1990s level by approximately 15 per cent and only returned to the previous level in 2004/05 largely as a result in the growth of coal traffic (SRA, 2005a). A change in data collection for tonnes lifted may account for some of the difference, but the major factor causing the divergent trends has been the increasing average length of haul for rail freight consignments.

## **5. Appraisal of the nature of the rail freight growth targets and forecasts**

There are some clear benefits associated with the standard tonne-based units of measurement:

- They are relatively simple: first, they are easy to collect, since they are based upon data routinely gathered by the rail industry; and second, they are easy to understand
- Standard tonne-based forms of measurement, particularly tonne kilometres, are increasingly used both nationally and internationally in official statistics, so their use allows international, longitudinal and modal comparisons

However, the focus on these forms of measurement raises a number of concerns:

- The narrow focus of tonne-based forms of measurement in rail freight targets and forecasts means that they are not necessarily aligned with broader policy objectives that consider, for example, social and environmental issues
- The emphasis on tonnes appears contrary to the likelihood that the majority of potential rail freight growth will come from relatively low weight sectors rather than traditional heavy products
- The forms of measurement largely ignore the effects of, and implications for, rail network capacity and capability, both in terms of routing services through the network and the wider issues associated with the availability and utilisation of train paths

The first of these concerns essentially echoes the wider concerns of target-setting that were discussed in Section 2. For the second, the sole emphasis on tonne-based forms of measurement as exemplified by the promotion of a tonne kilometres-based growth target as the means of measuring the degree of success of policies seems inappropriate. Traditionally, rail freight has rightly been seen as being dominated by commodities associated with heavy industry (e.g. coal, steel, aggregates). If rail is to diversify into the growth freight areas, particularly premium logistics, then tonne-based forms of measurement may not be the most appropriate units to use to assess rail's "worth". Passengers, by and large, exhibit more homogeneous characteristics than do

freight consignments, so the main forms of measurement of their activity (i.e. passenger kilometres and passenger journeys) do not give particular cause for concern. For rail freight, though, a trainload of coal or aggregates could weigh several times more than a similar length trainload of “premium logistics” products. While both may remove similar numbers of lorry journeys from the road network, offering decongestion and environmental benefits, the latter will be under-reflected in tonne-based statistics.

Good examples of the types of new flows that will be under-represented in the tonne-based statistics are the Anglo-Scottish premium logistics services on the West Coast Main Line, like those now operating for logistics companies such as WH Malcolm and Russell carrying mostly lightweight products for a range of retailers and manufacturers between Scottish terminals at Grangemouth and Coatbridge and Midlands terminals such as Daventry and Hams Hall. Table 4 compares these services with a coal train operating from Hunterston port to a Midlands power station, essentially sharing a common corridor. As the calculations show, a coal train operating over the same distance is likely to have a tonne kilometres weighting around 4 or 5 times that of a premium logistics service. It would therefore be far easier to achieve a target growth volume through new coal flows rather than premium logistics one.

*(Insert Table 4 around here)*

Another concern with the use of a tonne kilometres target is the distance element that it incorporates. Put simply, it would be possible to meet the target by taking all the goods that were carried by rail in 2000-01 over a distance 80 per cent greater in 2010-11 (i.e. increase the average length of haul from 190 kilometres in 2000-01 to 340 kilometres in 2010-11). In the ten years prior to 2000-01, the average length of haul for rail freight increased by 64 per cent, with the number of tonne kilometres increasing by 13 per cent at a time when tonnes lifted decreased by 31 per cent. Clearly there are limits to the growth in the average length of haul, given the size of Great Britain and the concentration of freight activity in the southern half of the country. However, it would

seem feasible that the average could increase towards 340 kilometres, given that this is approximately the distance between London and Leeds or Manchester and less than the distance between the key international entry/exit points (i.e. Felixstowe, Southampton and the Channel Tunnel) and those two major centres; many Anglo-Scottish flows are in excess of 600 kilometres in length. Such growth in tonne kilometres, but not in tonnes lifted, may not necessarily mean that rail is failing to increase its relevance for freight transport but if, as has been the case, average length of haul by road also increases substantially, then rail's market share of the tonnes available will not alter to any great extent. Basically, if both rail freight and the total freight market (by all modes), as measured by tonne kilometres, increase by 80 per cent by 2010, rail will do no more than retain the share of the market that it had in 2000.

Potentially of more concern is the influence of routing traffic through the rail network between origin and destination, whereby direct routes are replaced by less direct ones. No systematic analysis has been conducted to identify the existence of any such change, but it would not be surprising if it has been occurring to some extent, particularly as freight has had to fit in around the growth in the number of passenger trains operated over congested sections of route. The effects of two proposals reveal the potential for the number of tonne kilometres to be inflated simply as a result of freight trains being routed differently, rather than through any growth of the rail freight market:

- East Coast Main Line (ECML) upgrade – though currently stalled due to a lack of funding, a proposal was developed in the late-1990s to create additional capacity on the ECML through the provision of a four-track railway between London and Newcastle, utilising secondary lines for freight traffic along much of the route. Thus, instead of using the full length of the ECML between these two cities, freight trains would travel via Hertford, Lincoln, Pontefract, Eaglescliffe and the Leamside line. This would increase the rail distance by around nine per cent, with tonne kilometres increasing by this amount without any change in the amount of freight carried.

- Ipswich to Nuneaton – two main routes are available for traffic (mainly carried in containers from Felixstowe to the West Coast Main Line (WCML)) between these two locations, one via Peterborough and the other via North London. The latter has recently been upgraded to cater for 9'6" containers on standard wagons, but this route is less direct than that through Peterborough, where similar proposals for gauge enhancement have been put on hold. While the majority of container trains are already routed via North London, the growth in 9'6" containers make it likely that all such trains will soon require a gauge enhanced route – in this case, the North London line route from Ipswich to Nuneaton is 15 per cent longer than the more direct route via Peterborough.

It is to be expected that examples such as these will become more common as a result of changes in the use of the network. Gauge capabilities may become a more significant issue as 9'6" containers increase their share of the deep-sea port market, leading to a smaller range of routes being available for a greater proportion of container services. Longer rail distances between fixed pairs of origins and destinations would no doubt be the consequence in many cases. More generally, though, should passenger train frequencies continue to increase, the issue of train path availability will become more critical. These concerns are reflected in the Gauging Policy (SRA, 2005b) and the series of Route Utilisation Strategies that are currently being developed (see, for example, SRA (2005c), SRA (2005d)); a network-wide freight utilisation strategy is expected in the near future.

Another example of routing variations surrounds the movement of non-bulk flows on the less-than-trainload network. This network, operated by EWS under the Enterprise banner, has been cut back from its broad geographical coverage in the late-1990s to a more streamlined network in the early years of the 21<sup>st</sup> century. While difficult to ascertain the extent to which additional distance has resulted from the network-wide changes, evidence from annual databases of rail freight activity developed by the author suggests that certain flows between origins and destinations now travel by more

circuitous routes. For example, of the loss of direct services between London and Yorkshire results in wagons travelling via the West Midlands and/or Manchester. Perhaps a relatively extreme example is of traffic from Immingham to Ely, a distance of approximately 150 miles by Enterprise in the late-1990s, now having to travel via the West Midlands and London, inflating the number of tonne kilometres by approximately 120 per cent. Similarly, some traffic for the steel industry is now routed from north western Scotland through north east England to South Wales instead of the more direct route down the West Coast Main Line which was used previously.

In combination, the issues surrounding the availability of network capacity, capability and routing and the predicted growth of lighter-weight traffic flows emphasise the problems of relying on the tonne-based indicators. For example, EWS has highlighted the dangers of ignoring network capacity, stating that “this measure [of growth] is based upon...tonne kilometres...and not paths. It is essential to note that much of EWS's growth is expected to be in lighter traffic, requiring a more than doubling of paths” (EWS, 2000). Conversely, it is possible that in certain markets there will be a growth in tonne kilometres but with little or no impact on the number of trains operated or train paths required. According to White (2005), EWS has created the capacity to deliver 4.3 million additional tonnes of coal per annum without running a single extra train, through the use of higher capacity wagons and the lengthening of trains. EWS claims that this has prevented the need for 3,000 additional trains per annum. The implementation of plans for 2005/06 should allow a further 2 million tonnes of coal to be added to existing services, with trains potentially carrying up to 2,250 tonnes rather than the previous 1,425 tonnes. Related to network strategy and the availability of train paths is the complex issue of charging operators for access to the network. This is largely beyond the scope of this paper, but has been analysed by Nash *et al.* (2004), where their calculations reveal the importance both of tonne kilometres and of rail capacity utilised for these volumes.



It is evident from this discussion that an increase in the number of tonne kilometres of freight is not necessarily a good thing *per se*, nor is it the best way of monitoring rail freight activity and dealing with policy and operational issues. At the very least, it is important to retain the focus on rail's share of tonne kilometres, rather than their absolute number, since the former at least takes into account what is happening for total freight movement. The next section, however, examines other potential indicators of rail freight activity.

## **6. Alternative forms of measurement of rail freight activity**

Having discussed the shortcomings of the traditional forms of measurement, an assessment of the potential alternatives is required. The SRA, in its Corporate Plan 2003-04, appeared to recognise the issues relating to the traditional forms of measurement as tools in developing policy and achieving rail freight growth. One of the activities identified under the freight banner was to “(develop)...a wider range of key performance indicators and performance measures to better publicise the growth of rail freight” (SRA, 2003, p.15). Table 5 shows the range of additional indicators developed by the SRA and identifies the key benefits and drawbacks associated with each.

*(Insert Table 5 around here)*

There are benefits and drawbacks associated with each of these new forms of measurement, just as there are with the established tonne-based ones. However, it is evident from Table 5 that many of the forms of measurement could be complementary to both tonne kilometres and each other, and that some sort of “basket” of indicators is ideally what is needed. Those that appear to offer the best coverage to supplement tonne kilometres are market share (in some form), rail freight lorry kilometres equivalent and number of freight trains operated.

For market share, that relating to the surface market offers greater benefit than the share of the overall market, though a better option would arguably be the overall market excluding LGVs. Given that the surface market statistics are being published already, it seems sensible to retain this as a key indicator. Despite being measured in tonne kilometres, market share gives a straightforward indication of the extent of change in the relative importance of rail and road, albeit with certain caveats. Of the two forms of measurement relating to the impacts on road haulage, that of rail freight lorry kilometres equivalent is preferable since it relates more closely to the impacts of road freight activity through its inclusion of distance. Further, while it is currently calculated using a fairly simplistic tonne-based conversion factor, it would be possible to develop it to more closely relate to different sectors, specific flows, or geographical locations.

Number of freight trains operated gives a different perspective on rail freight activity and, while it has some drawbacks, avoids some of the problems of the tonne-based forms of measurement. Official statistics are not published on a historical basis, but Figure 3 shows the proportion of services accounted for by the three categories in each year based on original research conducted by the author (for further details, see Woodburn, 2006). Bulk services saw a reduction in their share of services between 1997 and 2004, at the expense of intermodal, while less-than-trainload (LTL) services accounted for a broadly similar proportion of all services in 2004 as in 1997, having declined dramatically since their peak in 2000. Despite this, the absolute number of LTL services was higher in 2004 than in 1997. Therefore, when considering more than solely tonne-based official statistics, there is some evidence of change in the market structure. There has been fairly sustained growth in intermodal, while the fortunes of the LTL sector have been poorer following rapid growth in the late-1990s. This disaggregated analysis of the number of trains operated provides greater insight than the global total published in the official statistics and would be a worthwhile addition to the forms of measurement already made available.

*(Insert Figure 3 around here)*

There are other potential ways of measuring rail freight activity. In the intermodal sector, for instance, the number of units carried may be appropriate, although this depends on the definition of a unit. If simply referring to a single container or swapbody, one unit is typically the same as a lorry load, thus making this unit of measurement similar in principle to lorry kilometres avoided, but number of units is more straightforward to calculate and understand. However, intermodal units differ in length and are often referred to in terms of TEUs (i.e. twenty-foot equivalent) to allow standardised measurement. When measured in TEUs, it is not possible simply to map lorry loads and rail freight units on to each other since a lorry load could be 1, 1.5 or 2 rail units. Moreover, there is an issue over how to incorporate any road legs that are required at the ends of the rail haul, plus variations in the haul distances for different units. Further consideration of this potential form of measurement would be required prior to adoption in the intermodal market.

In the KPI study of transport efficiency in the food supply chain, McKinnon *et al.* (2003) identifies additional forms of measurement of activity, recognising that there are problems with the traditional tonne-based units of measurement. A range of indicators was developed within five categories – vehicle fill, empty running, vehicle time utilisation, deviations from schedule, and fuel consumption. Those relating to vehicle fill are of particular relevance in that they measured payload weight, number of pallets and average pallet height, thus providing information relating both to weight utilisation and volume (cube) utilisation. Cube utilisation is of interest for rail freight activity in that it better reflects the carriage of lighter-weight products. However, given the more general requirements for rail freight activity calculation and monitoring it is better to focus attention on developing and refining the types of measurement already discussed before getting into greater detail on wagon fill. The non-tonne forms of measurement already explored take lighter-weight consignments into sufficient consideration for high-level analysis of rail freight activity. As and when the basic range of units of rail freight

measurements becomes bedded in it may be appropriate to reconsider some more detailed indicators such as wagon fill.

## **7. Conclusions and Recommendations**

As a result of the analysis in this paper, there seems to be a dual role for rail freight activity forms of measurement:

- External to the industry, some way of measuring rail's success (or otherwise) in reducing the dominance of road haulage, leading to greater sustainability of the freight transport sector
- Internal to the rail industry, a need to ensure sufficient capacity for growth: this suggests a need to focus more attention on number of trains operated and train paths available

In terms of internal measurement, the key issue relates to capacity availability and utilisation. It has been shown that tonne-based forms of measurement in isolation are an inappropriate guide both to current utilisation and future needs. The internal issues are important for the industry, but are also of great significance when considering rail's ability to cater for increased volumes of freight traffic.

In the wider context, it is of concern that the British growth target appeared to lose its link to rail's share of the freight market, since this at least offered some comfort that growth in rail for its own sake was not a satisfactory outcome for the Ten Year Plan. The subsequent forecasts make no mention at all of rail's share of the total market since they are essentially devised for internal planning within the rail industry. However, this paper has identified more fundamental problems with targets and forecasts such as these, even allowing for the relationship to mode share that was originally intended. While tonne-based forms of measurement are the standard across both road and rail, the sole focus on these to assess the extent to which rail freight is developing into new

markets, as is desired by government policy, does not provide a true indication of the nature and extent of change. The broadening of official statistics, first under the SRA and hopefully continuing under the Office of Rail Regulation (ORR), is a welcome step forward.

There is no single clear alternative form of measurement by which rail's progress towards meeting policy targets and objectives can realistically be assessed. It seems clear, though, that the current situation is certainly in need of improvement so that a better understanding of the issues can be gained and progress measured. This paper has not identified any clear direction by which rail's progress against policy objectives can be measured accurately and unambiguously. It has, however, raised a number of important issues for further analysis and discussion. Of critical importance is consistency over time in the methodologies for collecting and presenting data on rail freight activity, so as to allow the analysis of progress (or otherwise) towards policy goals. It is important that any additional forms of measurement adopted are supplementary to, and not replacements for, existing statistical measures to ensure consistency for historical series. There may be a reluctance to change the way in which rail freight statistics are gathered and presented since to introduce additional forms of measurement whilst retaining those already published may attract an additional resource cost due to the extra data collection and statistical analysis required. It seems clear, though, that extra forms of measurement, or key performance indicators, are needed that in combination provide a better overall picture of trends than has traditionally been the case. In this respect, the recent introduction of additional indicators in official statistics is a welcome development and the continued publication of these indicators is encouraged. In particular, the combination of the share of an appropriately defined freight transport market, the rail freight lorry kilometres equivalent and the number of freight trains operated should in time provide a stronger set of forms of measurement by which to monitor rail freight activity than the longstanding tonne kilometres measurement unit can on its own. There may well be a case, though, for the introduction of alternative forms of measurement that better reflect rail's role in the non-bulk market, such as a

specific focus on the number and share of containers and swapbodies carried in the intermodal market.

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Table 1: Claimed negative consequences of British government targets

<b>Nature of target</b>	<b>Alleged negative consequence(s)</b>
National Health Service (NHS) patient waiting list reductions	<ul style="list-style-type: none"> <li>• Risk of MRSA “super bug” due to focus on treating patients more quickly, with reduced attention paid to cleanliness</li> <li>• Delays in adding patients to official waiting lists after visiting doctor</li> <li>• Distortion of clinical priorities so as to focus on meeting specific targets</li> </ul>
Casualty department waiting times	<ul style="list-style-type: none"> <li>• Less seriously ill people prioritised to process them within target time, leaving more seriously ill people to wait longer, risking their safety</li> <li>• Some patients discharged before they have been adequately assessed</li> </ul>
48-hour appointment target for GPs to see patients	<ul style="list-style-type: none"> <li>• Some GP practices refusing to allow patients to book appointments more than two days in advance</li> </ul>
English and Mathematics targets for school children	<ul style="list-style-type: none"> <li>• Too much time spent in school focusing on passing the specific tests, with resultant neglect of other aspects of education</li> </ul>
Number of clients dealt with by benefits staff per fixed time period	<ul style="list-style-type: none"> <li>• Poor customer service resulting from trying to achieve higher throughput of clients</li> <li>• Dealing with clients’ problems over multiple visits, since each visit is shorter and counts towards target</li> </ul>
Ambulance response times for 999 calls	<ul style="list-style-type: none"> <li>• Health trusts seeking alternative ways of measuring response times which makes them appear to improve performance and meet target</li> </ul>
50% of young people entering higher education	<ul style="list-style-type: none"> <li>• Reduction in entry standards</li> <li>• Lack of resources to support higher student numbers</li> </ul>

Source: Guardian (2005a) and Guardian Online (2005 (various dates))

Table 2: British rail freight growth forecasts (2000 – 2010)

<b>Scenario</b>	<b>% growth in net tonne kilometres 2000 - 2010</b>	
	<b>MDS Transmodal</b>	<b>Sinclair Knight Merz</b>
Base	15%	3%
Medium	73%	80%
High	130%	147%

Source: SRA (2001a)

Table 3: British rail freight forecasts: 2014 (millions of tonnes lifted)

<b>Commodity</b>	<b>2003 actual</b>	<b>2014 forecast</b>	<b>% change</b>
Coal	46.0	52.9	15
Ore	6.1	5.7	(7)
Other minerals	19.7	24.9	26
Metals	10.5	12.1	15
Petroleum and chemicals	6.8	7.2	6
Waste	2.2	2.0	(9)
Auto	0.4	0.4	0
Network Rail own haulage	7.4	6.5	(12)
Maritime containers	11.1	21.1	90
Channel Tunnel	2.0	7.2	260
Domestic intermodal/wagonload	0.9	4.7	422
<b>Total</b>	<b>113.1</b>	<b>144.7</b>	<b>28</b>

Source: RFG (2005)

Table 4: Comparison of indicators for typical coal and intermodal freight trains between Scotland and the English Midlands

	Coal	Premium logistics
Approx. distance (km)	480	480
Approx weight of load (tonnes)	1,425	250 - 450*
Tonne kilometres	684,000	120,000 – 216,000

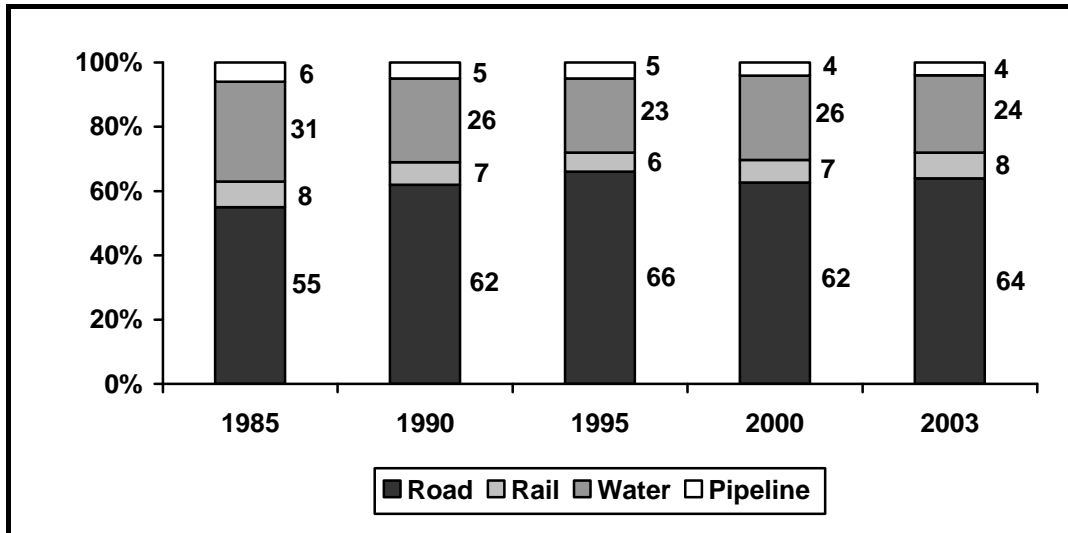
Source: White (2005) and original research\*

Table 5: Alternative forms of measurement of rail freight activity introduced by the Strategic Rail Authority (SRA)

<b>Measurement</b>	<b>Benefits</b>	<b>Drawbacks</b>
Share of surface market (rail and HGVs)	<ul style="list-style-type: none"> <li>• Close fit with public policies encouraging freight by less environmentally-damaging modes</li> <li>• Relatively easy to measure and understand, using data already collected as standard</li> </ul>	<ul style="list-style-type: none"> <li>• Considers only road and rail and omits, in particular, coastal shipping which is significant in the British market</li> <li>• Tonne-based units of measurement so suffer from problems raised in Section 5</li> </ul>
Share of overall market (rail, HGV, LGV, pipelines and water transport)	<ul style="list-style-type: none"> <li>• Close fit with public policies encouraging freight by less environmentally-damaging modes</li> <li>• Relatively easy to measure and understand, using data already collected as standard</li> </ul>	<ul style="list-style-type: none"> <li>• Tonne-based units of measurement so suffer from problems raised in Section 5</li> <li>• Inclusion of light goods vehicles (LGVs) adds in a freight market for which rail is not generally able to compete</li> <li>• Pipelines and water transport are also generally seen as less environmentally-damaging, so rail could achieve a higher market share without providing the desired policy benefits</li> </ul>
Impacts on road haulage – rail freight lorry kilometres equivalent	<ul style="list-style-type: none"> <li>• Close fit with emphasis in broader public policies to encourage sustainability</li> <li>• Particular emphasis on the road freight activity avoided through rail use</li> <li>• Closely relates to existing calculations utilised for rail freight grant funding</li> </ul>	<ul style="list-style-type: none"> <li>• Need either for large scale data collection and validation or relatively crude assumptions about nature and routing of consignments</li> <li>• Ignores location and timing of lorry kilometres avoided</li> </ul>
Impacts on road haulage – lorry journeys avoided	<ul style="list-style-type: none"> <li>• Close fit with emphasis in public policies to encourage freight by less environmentally-damaging modes</li> </ul>	<ul style="list-style-type: none"> <li>• Crude assumptions utilised to convert from rail freight volumes to lorry journey equivalents, unless comprehensive data are collected</li> <li>• Takes no account of distance, or of location or timing of lorry journeys avoided</li> </ul>
Number of freight trains operated	<ul style="list-style-type: none"> <li>• Relatively close relationship with utilisation of, and requirements for, train paths</li> <li>• No bias towards heavier consignments, unlike the tonne-based measurements</li> </ul>	<ul style="list-style-type: none"> <li>• Takes no account of train length and volume carried</li> <li>• Gives equal prominence to light and heavy trainloads, which may be problematic if statistics are not interpreted with caution</li> </ul>

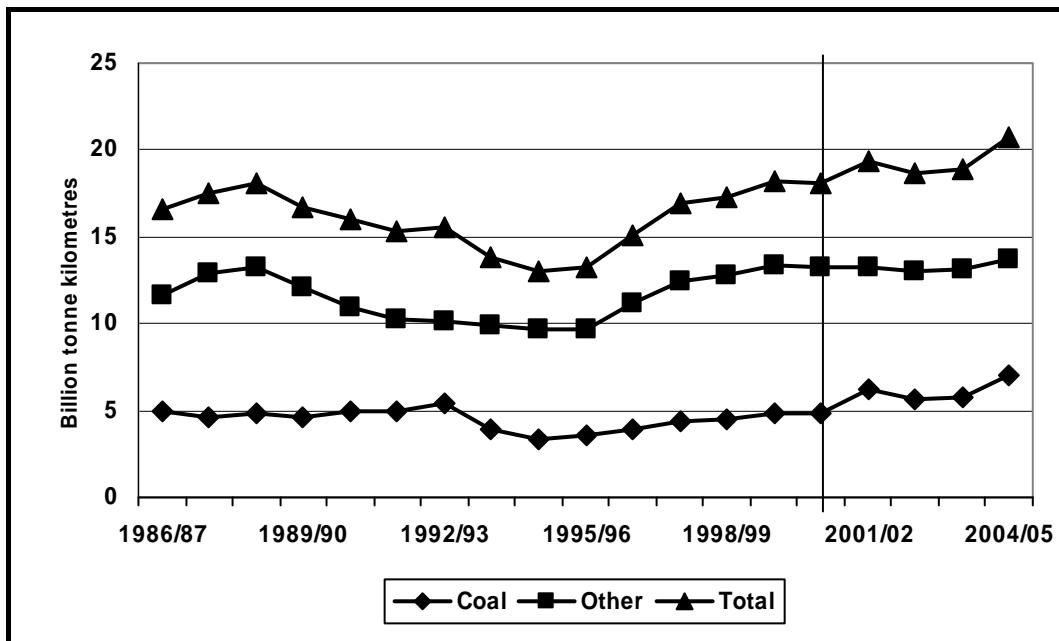
Source: original analysis of measures developed by SRA (2003)

Figure 1: Market share for domestic freight transport in Great Britain (% of tonne kilometres)



Source: DfT (2005); totals do not always add up to 100% due to rounding

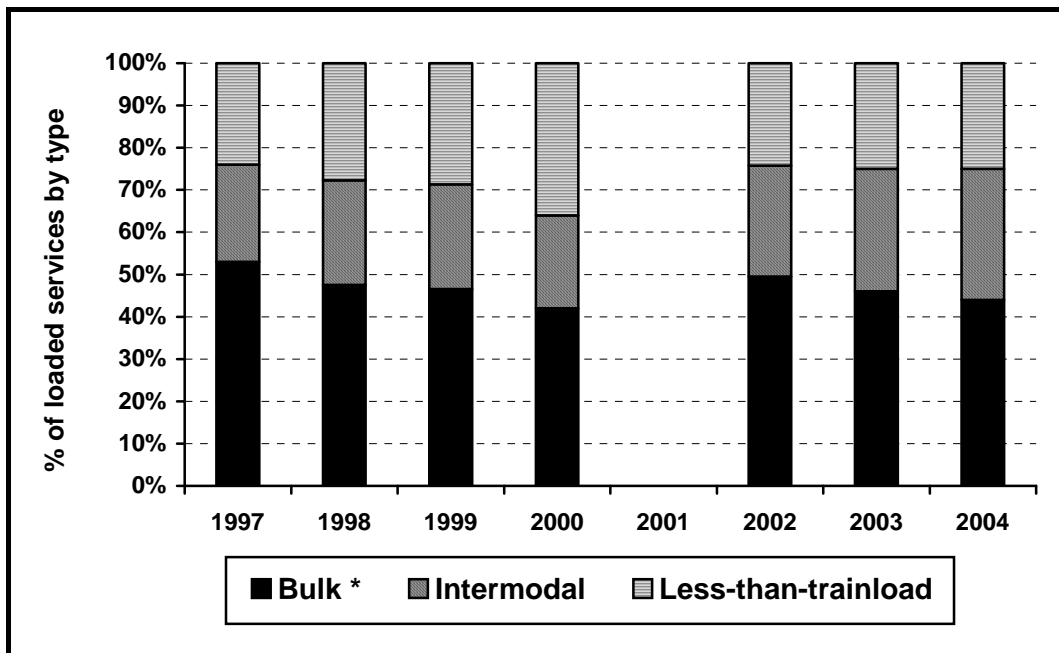
Figure 2: Freight moved by rail in Great Britain (billion tonne kilometres)



Source: SRA (2005a)



Figure 3: Percentage of loaded rail freight services by service type, 1997–2004



Source: author's databases (\* excludes coal and mail trains; no database was constructed in 2001 due to the post-Hatfield network disruption)