Report

The Economic Value of Rail in the North of England

July 2014

Pedro Abrantes and
Tom Ellerton

pteg Support Unit
Wellington House
40-50 Wellington Street
Leeds – LS1 2DE
0113 251 7204
info@pteg.net

With support from
SYSTRA

The Passenger Transport Executive Group (***pteg***) represents the six strategic transport bodies which, between them, serve more than eleven million people in Greater Manchester (Transport for Greater Manchester), Merseyside (Merseytravel), South Yorkshire (SYPTE), Tyne and Wear (Nexus), the West Midlands (Centro) and West Yorkshire (West Yorkshire Combined Authority). ***pteg*** is also a wider professional network for Britain's largest urban transport authorities.

This report forms part of ***pteg***'s wider role in stimulating debate around broader policy issues of relevance to transport, and in particular around the economic value of regional rail networks. We hope that it will help to generate ideas, discussion and feedback and therefore welcome any comments you may have on the points it raises. You can find our contact details on the back cover of this report.

pteg
the voice of urban transport

Content

Executive Summary

The rail network in the North of England is currently being examined as part of the re-franchising of the two main regional train operations. This process will define what the North's railway network will look like for the next decade and beyond.

In their joint consultation document, the Department for Transport (DfT) and Rail North (RN) consortium of local transport authorities highlight the relatively high level of operating subsidy from which regional rail operators currently benefit.

Although it's important to understand how this subsidy could be most effectively reduced over time, this tends to focus the debate on cost cutting measures and loses sight of the sizeable economic value delivered by the railway network.

The purpose of this report is to articulate and quantify these economic impacts and benefits. By doing so, we hope to re-focus the debate on the considerable economic prize which might be delivered through a step change in rail service quality across the North of England.

In this report we show that:

- The regional network in the North of England delivers **net economic benefits** in terms of improved efficiency, productivity and well-being amounting to **£1.6bn per year**. This is around **twice** the amount of rail funding provided through government grants and Network Rail borrowing.
- **Only one quarter of these economic benefits accrue to rail passengers themselves**. The rest come in the form of reduced road congestion, improved business productivity and the option or insurance value which rail networks provide.
- In addition to these economic benefits, regional rail spending also has a supply-side effect on the regional economy, with an estimated **direct and indirect contribution to regional economic output of £1.6 billion** per year, supporting **20,600 jobs**. Taking the UK economy as a whole, spending on regional rail networks in the North of England delivers £3.1 billion in national economic output.
- Taking net economic benefits and regional supply-side impacts together, the regional rail network in the North of England **delivers £4.30 of economic value for every £1 of direct government support** and government backed-borrowing. Once extra-regional impacts are taken into account, this takes this figure to over £6 of economic value for every £1 of government backing.

1. Introduction

The rail network in the North of England is currently being examined as part of the re-franchising of the two main regional train operations. This process will define what the North's railway network will look like for the next decade and beyond. The Department for Transport (DfT) and Rail North (RN) consortium of local transport authorities have set out their current views in a joint consultation document[1]. This report contributes to the debate by articulating the contribution which the regional rail network makes to the North's economy. It builds on a recent ***pteg*** *briefing paper[2] and forms part of our wider work on the economic value of regional rail networks.*

1.1. *Northern Rail* (NT) and *TransPennine Express* (TPE) are the two key regional operators in the North of England. NT's operations tend to focus on shorter distance stopping services along key commuting corridors as well as some long distance rural services, while TPE operates longer distance services linking key centres and the larger stations in between. TPE also operates services between Manchester and Scotland.

1.2. Other train companies operate across the North, the largest of which, *Merseyrail*, carries 42 million passengers in the self-contained commuter network radiating from Liverpool. *East Coast* and *Cross-Country Trains* complement TPE services in the corridor between the North East, York, Leeds and Sheffield, while *East Midlands Trains* complement TPE services between Liverpool, Manchester and Sheffield.

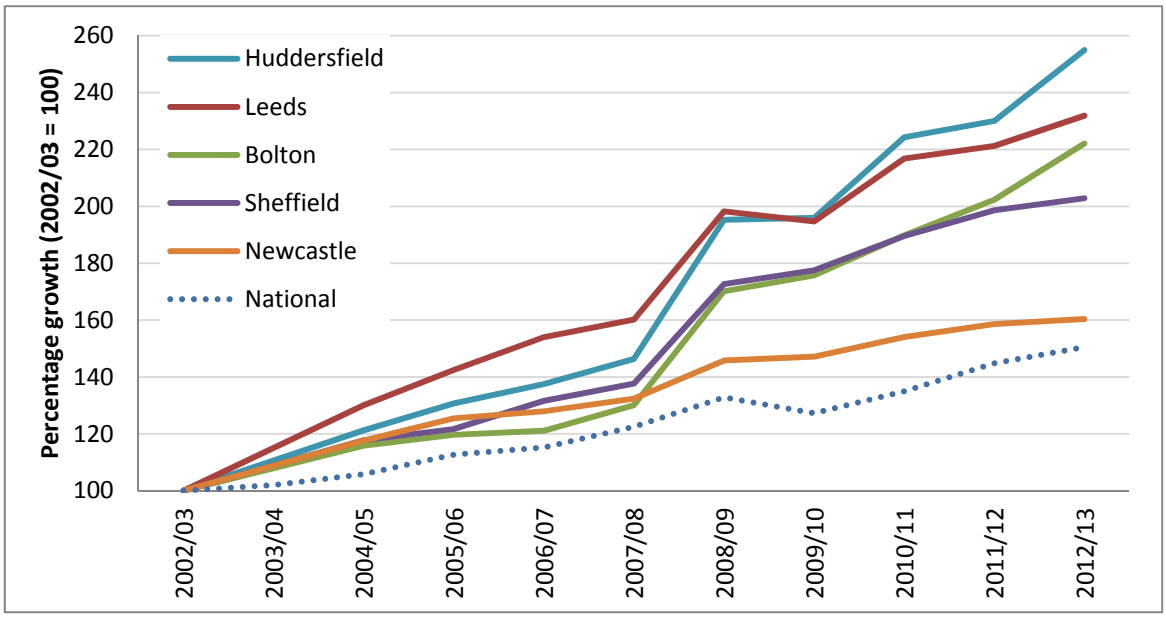
1.3. Around 115 million rail trips are made every year on NT and TPE services, more than the total number of rail journeys made in Scotland and Wales combined or on the whole of the Inter-city rail network[3]. Over the past decade, passenger numbers have grown at an unprecedented rate in the North of England, far outstripping the national average at many stations. Although the NT and TPE networks are centred on the largest regional centres, unprecedented passenger growth has been observed at many smaller stations.

1.4. For example, at Huddersfield station passenger numbers grew by 155% in the decade to 2012/13 while Bolton saw growth of 122%. Passengers at Newton-Le-Willows, a key commuter station situated half way between Manchester and Liverpool, increased three-fold over the same period, following investment in both infrastructure and enhanced services. Figure 1 compares passenger growth across these stations in the North against the national average.

1.5. Rail demand growth at these stations highlights the increasingly inter-connected nature of the North's economy and the key role played by regional rail networks.

[1] DfT and Rail North (2014) Stakeholder Consultation: TransPennine Express Rail Franchise and Northern Rail Franchise
[2] ***pteg*** (2014), Rail in the North of England – briefing. Available at http://pteg.net/resources/types/briefings/rail-north-england
[3] ORR rail statistics, 2012/13 figures

Figure 1. Rail passenger growth into key Northern stations



1.6. While the scale of train use suggests that the regional rail network has a high value, its total worth to the economy is not immediately clear – or, just as importantly, from what that value stems. Public authorities need to demonstrate, now more than ever, that whatever economic and social benefits rail networks give rise to justify the scale of public funding flowing towards passengers and operators. The key objective of this report is to articulate and quantify the wide range of economic benefits generated by rail networks in the North of England.

1.7. In this report, we demonstrate that:

- The regional rail network in the North of England delivers net economic benefits in terms of improved efficiency, productivity and well-being of £1.6bn per year. This amounts to over £2 of benefits for every £1 of government funding and Network Rail borrowing.
- Three quarters of benefits accrue to non-users rather than train passengers themselves. These benefits come in the form of reduced congestion, improved business productivity and the option or insurance value which rail networks provide.
- In addition, spending by train operating companies and Network Rail has a large direct and indirect impact on regional economic output, comparable to the scale of net economic benefits and supporting over 20,000 local jobs.

1.8. The next section describes the mechanisms through which rail networks generate economic benefits. The two subsequent sections set out, in turn, the economic value of the rail network to both rail passengers and the wider economy. We then highlight the macroeconomic contribution of the rail industry itself. The concluding section summarises our assessment of the overall economic impact of rail networks in the North of England.

2. How rail networks generate economic benefits

2.1. In this section, we explain the different mechanisms through which rail passenger services contribute to a more efficient and successful economy. We distinguish between benefits accruing directly to rail passengers (user benefits) and those accruing to the wider economy (non-user benefits). We then highlight the contribution which regional rail networks make to rural economies and freight transport.

Economic activity undertaken by rail passengers / User benefits

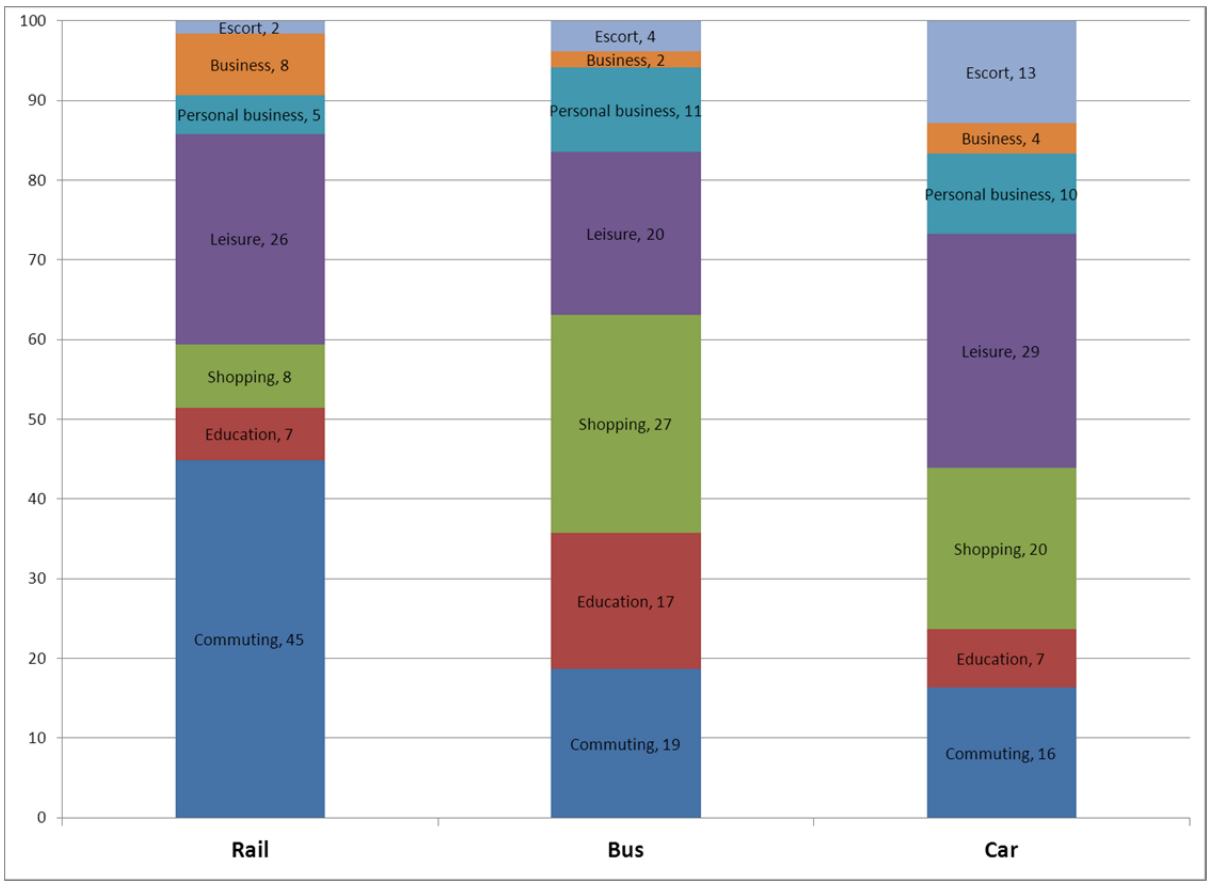
2.2. The value of rail services to existing passengers is easy to understand. If rail services weren't available then close to 2 in 10 rail journeys wouldn't be made at all[4]. Because rail services carry a large proportion of commuters (see figure 2), this means that many workers who currently use the train would be forced into a less productive job or move out of work altogether. Those current rail users who continued to travel to work by some other means would likely see a steep increase in transport expenditure and/or the amount of time spent travelling.

Morning rush hour at Leeds

2.3. Overall, we estimate that NT and TPE rail services carry around **200,000 commuters every day**[5], who contribute around **£9bn** to UK GDP per year[6]. If, in the absence of the rail network, a tenth of those commuters were to lose their job this would lead to a loss of GDP of £900 million per year.

[4] Source: DfT Rail Diversion Factors research
[5] This figure is derived by multiplying the annual number of rail trips on NT and TPE by the share of commuting journeys by rail (see figure 2) and dividing by 2x260. This assumes that each commuter travels to work 260 days a year and makes two rail trips each work day.
[6] GDP per worker is estimated as the weighted average across the five Northern metropolitan areas for producer and consumer service sectors. GDP per worker figures by sector and Local Authority district are based on the Department for Transport appraisal guidance on Wider Economic Impacts.

Figure 2. Journey purpose by mode of transport



Source: National Travel Survey, 2010.

2.4. One key reason why rail networks play such an important role in the labour market is that they provide an efficient link between the densest centres of employment and those areas where people want to live and can do so at an affordable price. In that sense, rail networks contribute directly to economic growth in two main ways:

- by allowing sustained jobs growth in the largest and most productive employment centres by preventing road gridlock;
- by unlocking new land for housing development.

2.5. KPMG estimated that overcrowding on NT services could have already lost Leeds and Manchester around 20,000 new jobs by 2013/14, **worth £500m in Gross Value Added**[7].

2.6. In the Leeds City Region, expected growth in jobs and housing has played a key role in defining long term transport investment priorities. According to the West Yorkshire Combined Authority, the area could miss out on 22,000 further potential jobs by 2026 due to worsening transport constraints, as firms would struggle to recruit from a shrinking labour pool[8]. Trains provide firms in large cities with a wider labour pool, linking a large volume of population with employment centres.

[7] KPMG (2010), Value for money in tackling overcrowding on northern city rail services. Report to the Northern PTEs
[8] Steer Davies Gleave (2014), Leeds New Generation Transport: Wider Economic Impacts

'If you build it they will come'

The railway network in the North of England has been a major success story over the past decade. Despite ageing rolling stock and a very limited amount of investment, demand into key Northern centres has far outstripped the national average. Where investment has taken place, results have been even more impressive. The case studies below illustrate this point and show how the local rail network has and will continue to contribute to support economic growth.

Liverpool South Parkway Station (LSP), for Liverpool John Lennon Airport

LSP opened in 2006, replacing two previously underused stations in South Liverpool. The £18 million upgrade created a state of the art transport interchange connecting local, regional and national trains with bus links to Liverpool John Lennon Airport and major local employers such as Jaguar Land Rover.

As the result of the station upgrade and a step change in the number of services stopping at LSP, passenger demand more than double from 288,000 in 2006/07 to 740,000 in 2012/13. Improved rail access has also contributed to the success of Liverpool John Lennon Airport, which has grown from one million passengers in 1997 to almost five million in 2012[9].

Sheffield Midland station

The £25 million regeneration to Sheffield Midland station concourse, access and facilities was designed to improve the image of the station, as well as generate substantial development and investment in adjoining areas. A central focus for regeneration was the development of the digital economy cluster surrounding the station. Passengers using the stations have since increased, from 5 million in 2004/05 before the upgrade, to 8.6 million in 2012/13, an increase of 72%.

Office rent around the station has increased at a quicker rate than the city centre average, growing 67% between the start of the project in 2003 and its completion in 2008, more than three times the city centre growth average. The redevelopment of the station was seen to play a central role in attracting new investment, creating office space for an additional 185 direct jobs, with up to 3,000 being created around the station. This generated an estimated £3.4 million of GVA[10].

Manchester Airport Station

Opened in 1993, Manchester Airport Station was part of a wider £60 million transport interchange to provide "seamless travel into the heart of the airport by bus, coach, train and tram". The rail station opened with two platforms and a third one was added later to allow for additional services. In 2012/13 over 3.1 million people travelled to the station by train.

Manchester Airport is the third largest in the UK by passenger numbers and the 21st largest in Europe. By 2015, Manchester Airport is expected to reach 40 million passengers per year. Its success has placed considerable pressure on the local transport network and, in order to enable sustained growth, the airport has the ambitious target of getting 40% of passengers and staff to travel to the airport by public transport. With train services set to expand as the result of the nearby Northern Hub project, it is expected that the rail network will make a significant contribution towards this goal[11].

[9] Information for this case study taken from: NG Bailey "Liverpool South Parkway Station Interchange", http://www.baileyrail.co.uk/liverpoolinterchange.html, ORR station data, and Liverpool John Lennon Airport, Peel Airports consider partners at Liverpool John Lennon Airport, http://www.liverpoolairport.com/peel-airports-considers-partners-at-liverpool-john-lennon-airport-2/

[10] Information for this case study taken from: Steer Davies Gleaves (2011), The value of station investment, and ORR station data and ORR station data

[11] Information for this case study taken from: Steer Davies Gleaves (2011), the value of station investment, Manchester Airport "Fact Sheet: The station, http://www.manchesterairport.co.uk/manweb.nsf/All+Content/TheStation, and ORR station data

2.7. But trains do much more than linking households to jobs, they also provide vital connections to shopping, leisure and education opportunities. A recent survey shows that 15% of those travelling to city centres for shopping and leisure purposes get there by rail and light rail, spending an average of £56 per visit, compared to £66 spent by car users[12]. Taking the national share of rail trips for shopping and leisure purposes, we estimate that **the rail network in the North of England supports total retail and leisure spending in excess of £1 billion per year**[13].

2.8. Rail networks in the North significantly improve the accessibility of more remote leisure destinations such as the Lake District, Yorkshire Dales, and parts of the North York Moors, Peak District and important coastal areas. In turn, this generates tourism benefits, stimulating local economies as well as providing accessibility and social benefits.

2.9. Rail networks enable children and young people to access work, training, education and other opportunities. Our analysis suggests that travel by children and young people represents at least 12% of all journeys on NT and TPE services. They make an even higher proportion of rail travel in metropolitan areas. Part of this demand is driven by the increasing number of young people who attend college and university while staying in their parental home. Of the quarter of a million higher education students in the North of England, less than half reside in the same Local Authority area as the Institution which they attend[14]. This would suggest that there are potentially close to **100,000 students** who, at some point, rely on the North of England rail network to get to University.

2.10. In summary, train services support the efficient functioning of the economy by enabling a wide range of activities to take place. The economic value which rail services bring to users can therefore be seen as a share of the wider economic and social activity that it enables, and the benefits that this activity gives rise to. Leisure activities, such as visiting family and friends, though not necessarily resulting in financial gain, will still hold an economic and social value - otherwise, individuals would choose to do something else with their time.

Impact on non-rail users and the wider economy / Non-user benefits

2.11. Although regular users are the most obvious beneficiaries of rail networks, we know that non-users and infrequent users (i.e. society at large) can receive an ever greater share of the total benefits generated. These benefits come in three main forms:

- decongestion and other externalities (such as reduced accidents, noise and pollution);
- option and non-use values;
- wider economic impacts (agglomeration benefits).

2.12. Decongestion benefits can be very significant, if often overlooked. In some large cities, such as Manchester, trains now carry as many trips as buses and cars into city

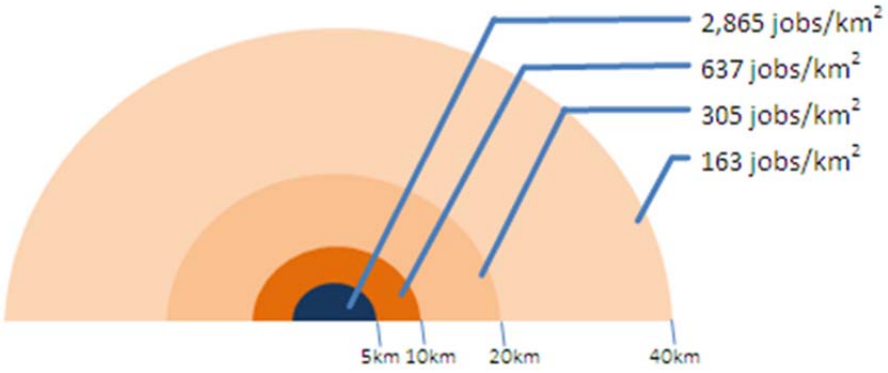
[12] Johnson, D., Mackie, P. and Shires, J. (2014), Buses and the Economy II – main report. Institute for Transport Studies, University of Leeds.
[13] Key inputs: 110 million single rail trips, 40% of trips for shopping and leisure purposes, whole journey assumed to be composed of two single trips, £55 spending per journey.
[14] ***pteg*** analysis of Higher Education Statistics Agency data for 2010/11

centres, during the morning peak hour[15]. If even a third of those rail trips were made by car instead then city centres would literally grind to a halt. In practice, there is little spare capacity left at peak times, which means that future growth in highly productive city centre jobs would be severely compromised.

2.13. The cost of moving goods around would also increase, in particular for retail, which would have an impact on the final price paid by consumers. Conversely, if rail services were able to attract just a quarter of commuters driving into metropolitan city centres then peak car speeds would increase by more than 50%[16]. For a typical delivery company, this could lead to a dramatic reduction in staff and fleet costs as fewer drivers and vehicles would be required to make the same number of deliveries.

2.14. Rail networks (and public transport more generally) are effectively one of the key enablers for high density urban areas to develop and remain sustainable, especially as personal income and car ownership continue to increase in the longer term. For the service sector in particular, density is in itself a key driver of productivity[17]. For example, for a 1% increase in the effective density of producer services within a given area there is likely to be a 0.08% increase in output per worker[18]. This means that the decongestion benefits attributable to rail services give rise, in turn, to wider economic benefits due to lower business costs and higher productivity. Research has shown that, for public transport improvements in large urban areas, these wider economic benefits can amount to around a quarter of decongestion and user benefits[19].

Figure 4. Job density by distance from the city centre (5, 10, 20 and 40km radius)



2.15. An important point to take from this is that **some of the most significant benefits generated by rail networks actually accrue to those transport users and economic activities which are least likely to travel by train, including taxis, goods vehicles and high income car users**. Whilst these users might not use the train, they will benefit from others using the rail network, primarily through decongestion benefits. This is one reason why public intervention in this policy area is necessary and justified.

[15] Source: PTE area city centre traffic count data, 2010/11 figures.
[16] Estimate based on speed flow curves in the FORGE model (DfT, 2005), for inner conurbation A-roads. Assuming current speeds of around 18km/h (Manchester, CGN0203 table), this would imply flows of 630pcus per lane. A 25% reduction in traffic would take flows below 504pcus, which is the point at which speeds are assumed to reach 30km/h, a 67% increase. Taking into account differences in speed across PTE areas, a 50% increase is a conservative assumption.
[17] Transport Works (2012), Making the case for city region transport investment
[18] DfT (2012a), Transport Analysis Guidance Unit 3.5.14: The Wider Impacts Sub-Objective
[19] Feldman et al (2007), Transport investments, the wider welfare benefits and the GDP effects of transport schemes.

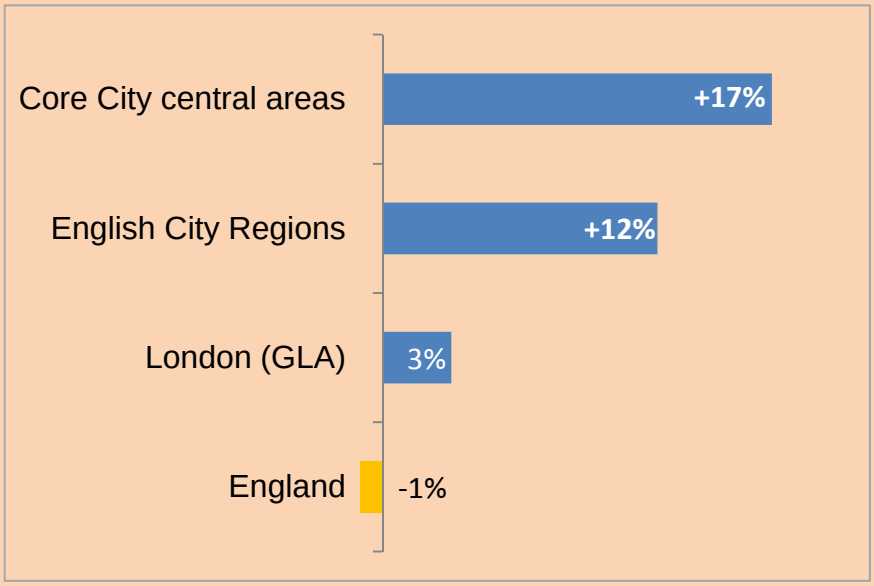
Rail, cities, jobs and economic growth

The three regions of the North are home to 7 million jobs or 26% of the total English labour market. Together, they generate £265 billion in Gross Value Added, placing the North of England somewhere between Denmark and Sweden in terms of economic output.

The vast majority of jobs in the largest Northern cities tend to be in the private sector and many are in the most productive and fastest growing sectors of the economy. The central areas of Leeds and Manchester alone concentrate over 320,000 jobs, more than half of which are in high value added consumer and business services[20]. In the decade before the recession, growth in financial and business service jobs was highest in the city centres of the largest urban areas outside London, the areas which benefit from greatest rail accessibility.

Rail networks help ensure that key employment centres remain accessible and are able to grow. Over 70% of jobs in the North are within walking distance of a rail station[21] and a further 20% are a short cycle, bus or car trip away[22].

Figure 5. Change in financial and business service jobs between 1998 and 2008



Sources: Smith, R. (2012), City Employment: an overview from the Business Register and Employment Survey (BRES), Centre for Cities briefing paper; pteg (2014), Transport Works for Growth and Jobs.

2.16. Non-users and infrequent users can also derive significant additional benefits in the form of option and non-use values, which we discuss later in the report. An appreciation of option and non-use values can be important in justifying public funding of services which may hold a high stand-by or insurance value.

2.17. Finally, it is often easy to forget that, by supporting the rail industry, users and government are actually contributing directly to job creation and economic growth. Unlike many parts of the economy, the rail industry is largely local in nature. Drivers, conductors, station and maintenance staff tend to live near their place of work, and their jobs cannot be easily moved to a different region, let alone a different country. The

[20] ***pteg*** analysis of Annual Business Inquiry data, 2008 figures.
[21] 4.4million jobs within a 2km radius from rail stations served by Northern, TPE and Merseyrail.
[22] Within a 5km radius from rail stations served by Northern, TPE and Merseyrail.

UK has also developed considerable expertise in rail engineering, design and manufacturing. There are several UK companies as well as others based in the UK with a strong international reputation, such as Bombardier, Mott McDonald and WS Atkins, while others, such as Hitachi, have recently decided to locate new manufacturing bases in the UK. It can also be argued that experience in the rail industry equips workers with key transferable skills in engineering, management, marketing, customer service and economics, which can be valuable in other sectors.

But the benefits of regional rail networks extend well beyond the largest cities

Rural rail

2.18. Rural rail has gone through a revival over recent years, with increasing passenger and freight usage.

2.19. Rural stations increasingly expand the catchment of urban areas, with train travel providing shorter journey times to more distant locations. This enables cities to develop more dense economies, producing agglomeration benefits and ensuring that employers have access to suitable labour markets. As well as enabling the growth of cities, local benefits are also felt in more rural areas. Transport networks provide increased connectivity, encouraging population growth which in turn boosts local spending and supports local businesses and economies.

2.20. But benefits to rural areas are much wider than those linked to commuting, with stations in the national parks providing leisure access to large numbers of people, removing traffic from sensitive roads and making areas with poor road links more easily accessible. The success of rail in Cumbria is particularly noteworthy, with Oxenholme and Windermere stations experiencing growth of 56% and 74% respectively from 2002/03 to 2012/13. Overall 6.25 million train journeys were made into and out of Cumbria, in 2012/13, (4.5m excluding Penrith and Carlisle on the West Coast Mainline)[23].

2.21. Where investment has taken place, stations outside of the big cities such as Skipton and Ilkley near Leeds have seen phenomenal growth. Passenger numbers grew from 648,145 in Skipton and 629,166 in Ilkely in 2000/01, to 944,214 and 1,211,992 respectively in 2012/13, growth rates of 46% and 93%[24]. This coincided with the electrification of the line and the introduction of newer, more comfortable rolling stock.

[23] ORR station data
[24] ORR station data

Growth in rural rail and tourism – bringing economic benefits to the North

The North of England has a strong and growing tourism economy, largely centred on its four National Parks and many Areas of Outstanding Natural Beauty. Rail plays an important role in ensuring that people can access often secluded tourist attractions, reducing the number of cars on sensitive roads and widening access to all.

Settle to Carlisle

The Settle to Carlisle railway line links the West Yorkshire conurbation with southern and western sections of the Yorkshire Dales and Cumbria. Described as one of the most beautiful railway journeys in England, the line has seen a steady increase in passenger numbers, with a third of a million people using the stations on the line each year[25]. This represents an increase of 25% from 2002/03

The route plays a vital tourism and freight role. Regularly served by 500 seat steam trains, the railway pulls tourists into Yorkshire and Cumbria from around the world. Increasing traffic on the railway, this provides a vital economic boost for rural towns and villages along the line. On the freight side, between fourteen and eighteen trains use the line each day. This takes slow moving traffic off the overcrowded West Coast Mainline and Manchester to Leeds and Sheffield routes, as well as removing heavy goods traffic from the Yorkshire Dales roads[26].

Scarborough

Scarborough is a popular tourist destination and key economic centre located on the North Yorkshire coast. Linked to York, Hull, Teesside and Leeds by single carriageway roads, and with high pressure on limited parking resources, Scarborough suffers from congestion and difficult access at key times. With the cost of fully upgrading the A64 – the key road linking York, Leeds and the M1 to Scarborough – an estimated £500 million, rail travel plays a key role in enabling the continued success of the destination[27]. Since 2002/03, Scarborough station has seen a 30% increase in passengers numbers, growing to over 880,000 passengers per year in 2012/13[28].

Rail freight

2.22. Rail freight supports local industries, reduces road congestion, improves road safety, the quality of the environment and directly creates jobs. Across Great Britain, rail freight is estimated to remove around 6.6 million lorry journeys from the road network every year[29], a figure that is expected to double by 2030[30].

2.23. Nowhere is this contribution more felt than in the North of England, which is origin or destination to more than 40% of national rail freight tonnage[31]. In addition, all freight traffic between Scotland and the rest of England and Wales needs to cross the North of England, further adding to that number. As a result, some rural lines, such as Settle-

[25] This figure includes all stations between Settle and Carlisle excluding Carlisle. From ORR station data.
[26] Information for this case study has been taken from: BBC, "Settle to Carlisle line: shortage of trains hampering growth", http://www.bbc.co.uk/news/uk-england-26976250
[27] Yorkshire Post (2013), A64 traffic blackspot could at last get £315 upgrade
[28] ORR station data
[29] Network Rail (2013), Value and importance of rail freight
[30] Railway Strategies (2009), Rail freight forecast to double by 2030
[31] In comparison, less than 10% of freight tonnage originates in London and the South East.

Carlisle[32], have comparable volumes of passenger and freight trains, with freight tonnage significantly exceeding passenger tonnage on a daily basis.

Freight train passing Church Fenton

2.24. Although this report focuses on the benefits of regional passenger services, it is important to bear in mind that the infrastructure on which those services run also serves other purposes. One important implication of this is that the withdrawal of passenger services from corridors shared with freight would generate little or no savings on the infrastructure side. In fact, a recent ***pteg*** report[33] suggests that rail freight has a much greater impact on the cost of infrastructure maintenance and renewals than is often acknowledged.

2.25. Essentially, this means that the value for money estimates we present in this report are fairly conservative. They under-estimate benefits of regional rail networks by excluding freight and they over-estimate costs by allocating all infrastructure and maintenance costs to passenger trains.

3. User benefits – supporting individual mobility and access to opportunities

3.1. Rail networks serve many different markets. In presenting our analysis of user benefits, we structure our results by ticket type as shown in table 1. Although there isn't a one-to-one relationship between ticket types and journey purposes (such as commuting, leisure, education or business travel), this segmentation provides an idea of the kind of travel being undertaken. For example, commuting dominates season ticket use, whereas reduced (typically, off-peak) tickets tend to be split more evenly between different purposes. Use of advanced tickets, on the other hand, tends to be mainly for leisure purposes.

[32] Other obvious examples include Carlisle-Newcastle and Doncaster-Cleethorpes (which serves as the access route to the Humberside port of Immingham).
[33] ***pteg*** (2014), A heavy load to bear? Towards a fairer allocation of rail industry costs for regional rail.

Table 1. Rail demand in the North of England

Ticket type	Share of demand	Annual rail trips (million)	Average trip distance (km)
Full	27%	26	32
Reduced	30%	33	38
Season	25%	29	24
Advanced	2%	2	129
Child concession	5%	6	24
Young Person	7%	7	56
Senior	2%	2	55
Airport	2%	2	67
TOTAL	100%	107[34]	36

*Source: 2011/12 **pteg** estimates based on Rail North demand and revenue model.*

3.2. Our approach to the quantification of user benefits is based on the assumption that, if an individual chooses to travel by train to get to work, the shops or education, this indicates that this option has a greater economic value than the next best alternative (for example, staying at home or travelling by another mode). Because the rail service makes this activity possible, then the rail trip itself must have some intrinsic value of its own.

3.3. It therefore becomes necessary to understand what value each passenger places on the rail service, over and above the fare actually paid[35]. Some passengers would have been willing to pay substantially more, for example if they were making a particularly valuable trip and had limited affordable alternatives available: others, on the other hand, would pay no more than the current fare, for example, if they had good cheap alternatives.

3.4. The difference between the value which users place on the service and the fare actually paid is referred to as **Consumer Surplus**. The full economic value of the rail trip is represented by the sum of the Consumer Surplus and the fare paid. However, it is possible to show that the fare represents a good indication for the value which would have been derived from the next best alternative in the absence of a rail service. We therefore take Consumer Surplus as a measure for the **net economic benefit** which would be lost in the absence of the rail network.

3.5. To represent how willingness to pay varies across existing and potential users, economists often use the concept of market **demand function**. This expresses the relationship between the fare level and the number of rail trips made, and can be seen as representing the price which different people would be willing to pay for that service.

3.6. Market demand functions for each of the ticket types listed in table 1 have been derived from statistical analysis of 10 years' worth of rail ticket data covering the North of

[34] This figure excludes travel to/from Scotland and hence it may vary from other quoted estimates of the total demand carried by Northern and TPE.

[35] If every passenger derived a benefit exactly equivalent to the fare level then the total farebox revenue would give us an accurate indication of the benefits derived by passengers. In reality, each passenger will derive a different amount of benefit from the rail trip. For a small proportion of passengers, this will be very close to the fare level but for the vast majority of passengers this will be considerably higher.

England. Based on this information and knowledge of current demand, fare levels and journey times, we have been able to estimate the net economic benefits derived by rail users, which are set out in table 2[36].

Table 2. User benefits from rail travel (PTE areas) – 2012 prices

Ticket type	Net economic benefit (£m per year)	Net economic benefit / trip (£)	Full economic value / trip (£)	Full economic value / trip-km (£)
#	(1)	(2)	(3)	(4)
Full	133	5.1	10.0	0.31
Reduced	124	3.8	7.9	0.21
Season	68	2.4	4.7	0.20
*Child concession**	*54*	*9.3*	*10.9*	*0.45*
Young Person	31	4.3	9.4	0.17
Senior	23	9.7	14.4	0.26
Advanced	13	7.4	18.2	0.14
Airport	9	4.0	13.2	0.20
TOTAL/AVERAGE*	**402**	**4.0**	**8.1**	0.22

** We have reasons to believe that the estimate of economic benefits relating to child concessions are an over-estimate. These are detailed subsequently in this section of the report. For this reason, the total/average figures in the table exclude child concessions.*

3.7. Our analysis shows that the net economic benefits accruing to rail passengers are of a similar order of magnitude as fare-box revenue or the total operating subsidy provided by government to NT and TPE. This, in itself, is not sufficient to justify public subsidy for the railways. However, it demonstrates that this subsidy enables activities with high economic value, at least for users themselves.

3.8. We would expect these figures to increase in line with the growth in rail demand and the growth in real income levels. Based on current forecasts, this suggests that the real economic value of the regional rail network to passengers could almost double over the next 15 years.

3.9. The right-most column (4) in table 2 represents the full economic value per rail trip in the North of England, taking account of travel distance. With the exception of child and senior concessionary tickets, the results appear highly plausible. Travel on full tickets, likely to include the greatest share of business travel, has the highest economic value per trip-km. This is reflected in the estimate of net economic benefits (column 1), where full ticket travel reaps the largest single share (£133m per year, or one third of total economic benefits). Travel on reduced tickets, while holding a lower economic value per km, comes a close second in net benefit terms, reflecting both the larger volume of trips and the longer distances travelled. This ticket segment is likely to contain a combination of off-peak commuting and leisure travel, including high value shopping trips.

[36] Our methodology is detailed in separate technical papers, which can be made available on request from the authors of this report.

3.10. Season ticket travel, which makes up 25% of all trips attracts only 17% of total economic benefits in the North of England. This reflects, in part, the short distance of trips using season tickets, which are often for commuting purposes.

3.11. Travel on advanced tickets (typically for leisure purposes) has the lowest value per km, followed by travel on young person's railcards. In absolute terms, advanced travel has less than half the economic value per km of travel on full tickets. Trips using season, reduced and airport-bound tickets all have a broadly similar value once distance has been taken into account.

3.12. The results for concessionary tickets are more difficult to interpret. In the case of senior tickets, the higher willingness to pay could suggest a strong preference for rail travel compared to other modes, for example, due to greater comfort and better vehicle accessibility. However, it is difficult to see how travel by children and young people could have a higher economic value than, say, a commuting trip of similar distance. We have therefore excluded this passenger group from our analysis.

3.13. The economic benefits of rail in the North of England extend well beyond the largest urban areas. Trips which start outside the five metropolitan areas represent 24% of total demand, 30% of Consumer Surplus and 33% of fare-box revenue[37]. This highlights the role of the local rail network in connecting the wider regional economy and supporting smaller economic centres as well as rural areas.

Investment in local rail networks benefits passengers and the wider economy alike

The benefits of rail go far beyond those commuting into the largest cities of the North, with wider economic benefits and non-user benefits occurring in a number of forms. What's more, where investment has occurred, significant new user and non-user benefits can be created.

Glasshoughton Station, West Yorkshire

Glasshoughton Station is located 12 miles south east of Leeds on the Pontefract line. The station was opened in 2004 as part of a major regeneration project to transform a former colliery and industrial estate. Built at the centre of a growing retail, leisure and housing development, the £2.1 million station provides park and ride facilities, access to the nearby facilities as well as commuting links for people living in and around the development.

The station has proved very successful, with passenger growth outstripping projected demand. In 2012/13, 180,166 passengers used the station, almost three times the original forecast. With over £100 million in private money having already been invested in the area, and further planned expansion to housing, retail and the potential relocation of Castleford Tigers Rugby League Club, the station looks set to continue to grow[38].

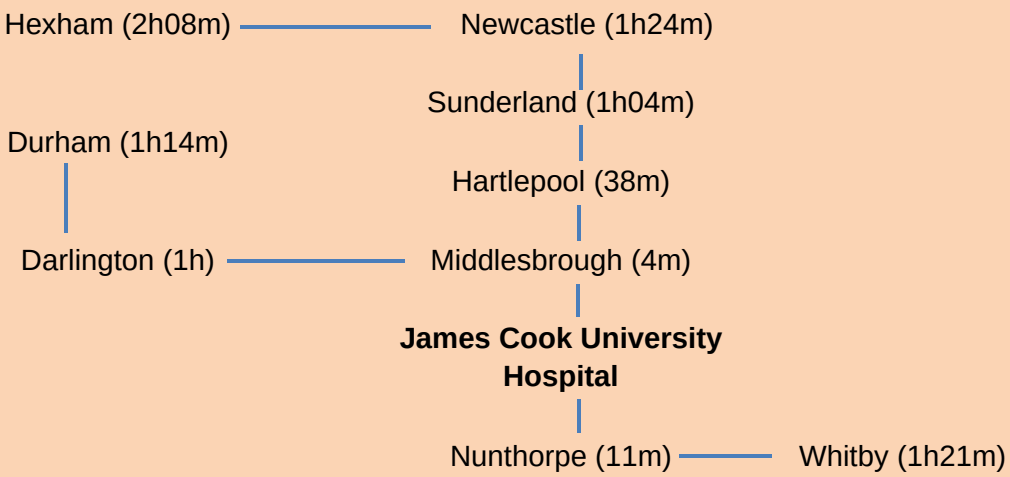
James Cook University Hospital Station, Middlesbrough

A good example of the wide range of user and non-user benefits which the railway delivers is the new £2.2 million station opened in May 2014 at James Cook University Hospital, Middlesbrough. Serving a regional population of 1.5 million people, the hospital provides specialist services to large parts of the North East, North Yorkshire and parts of Cumbria. With around 5,000 staff and 1,000 beds, the hospital generates thousands of daily trips[39].

[37] Information taken from the Rail North model
[38] Information for this case study was taken from: Waystone website: Glasshoughton master plan http://www.waystone.co.uk/UK-Sites/Glasshoughton/Master-Plan-Glasshoughton , and Department for Transport, "station usage and demand forecasts for newly opened railway lines and stations.
[39] ***pteg*** estimates based on the number of staff employed across the South Tees Hospitals and the number of trips that the staff and hospital beds are likely to create

Alongside the new station, the level of service on the line has been improved from 11-12 trains per hour to 17 in each direction. This has been achieved through making the most of existing infrastructure and adding additional trains between Middlesbrough and Nunthorpe.

Figure 3. Stations connected to James Cook University Hospital Station



The hospital is located on the A172, an overcrowded strategic transport corridor. The A172 is 1 of 5 arterial routes into Middlesbrough, linking areas such as Whitby to the South and East with Middlesbrough town centre, the port and large industrial estates. With over 50% of the traffic on the A172 entering the hospital, there is significant scope to remove cars from the road, decreasing congestion, improving access for people needing to get to the hospital quickly and reducing the hospitals carbon footprint. The hospital has a long term ambition of reducing reliance on car journeys by 20%, which is being aided by discounted local train season tickets and hospital appointments being aligned with the train timetable.

The station is located in a growth area for Middlesbrough, with plans in place for a new sports village and considerable housing development around the site. With the existing transport corridor already congested, the station offers a sustainable solution to access employment and leisure opportunities[40].

3.14. Whilst the net economic benefits are high currently, these are expected to grow significantly over time, in line with increasing rail use and cost of alternative modes of transport.

User benefits and the national economy

3.15. We have so far implicitly taken user benefits to represent a net gain to society. But how do user benefits impact on the wider economy, and in particular on the measures of aggregate economic output which debate tends to focus on?

3.16. One way to think of national economic output is as the aggregation of all economic benefits accruing to individuals. So, for example, when somebody is able to access a higher paid job by using the rail network they reap a direct financial benefit, but this will also tend to be reflected in national accounts. When an individual benefits from a shorter rail journey, they can use that time saving, for example, to work more, undertake training or carry out a leisure activity which, in turn, could improve their

[40] Information for this case study was taken from: South Tees NHS (2013), Rail halt approved, http://southtees.nhs.uk/news/hospitals/rail-halt-approved, and South Tees NHS (2014), Full steam ahead for hospital rail station, http://southtees.nhs.uk/news/trust/full-steam-ahead-hospital-rail-station/.

health and productivity. Additional work hours appear directly in national accounts as will, eventually, the increased output from improved productivity.

Improved health may also result in reduced government expenditure, which can then be put to more productive uses. In some cases, such as trips to attend training or education, individual willingness to pay may reflect the expectation of higher future earnings rather than short term gains.

3.17. Although the net economic benefits measured through Consumer Surplus are not strictly the same thing as Gross Domestic Product (GDP) or Gross Value Added (GVA), in many cases, they represent a useful proxy. Many would also argue that net economic benefits, where they can be measured, represent a better estimate of a society's economic performance[41].

3.18. So, in summary, the higher the economic benefits derived by rail network users the greater the contribution rail services are making towards the economic well-being of society as a whole. Assuming users have full information and behave rationally, the aggregate estimate of willingness to pay is likely to closely match the overall contribution rail networks make to the economy through user benefits. In the longer term, this economic contribution can make a place cheaper or more attractive to do business in and workers more productive.

[41] See, for example, SACTRA (1999), Transport the economy.

Rail networks and flexible labour markets

Rail networks help the functioning of the economy by contributing towards more flexible labour markets, for example, in the following ways:

- **By increasing the number and range of jobs accessible to workers**. Over 70% of jobs in the North of England are within walking distance of a rail station[42], with 90% being a short cycle, bus or car trip away[43]. Rail plays an important role in ensuring that people can access these jobs, and that employers have a suitable labour pool to select from[44].
- **By improving the match between workers and jobs, thereby raising productivity**. Recent research[45] shows that close to 2 in 10 journeys currently made by rail would not be made if rail was no longer available.
- **By making work pay**. Transport costs can absorb much of low income workers' wages, thereby reducing the financial reward from being in employment. The availability of discounted tickets can have a significant impact on the incentives faced by these workers and increase the supply of labour.
- **By providing a key link to education and training.** The majority of young people do not have access to a car and therefore depend on public transport services to reach specialist education facilities. With an increasing number of people not living in the same Local Authority as they are studying the train is playing an increasing role in ensuring that people are able to access education opportunities.

Case study: *Interaction between Northern City regions*

A study by the London School of Economics[46] found that commuting between the Leeds and Manchester city regions is about 40% lower than expected given their size and proximity, with long travel times offered as a possible cause. Reduced access between the two markets is expected to hinder productivity gains through competition and specialisation.

The research went on to estimate that **a 20 minute reduction in train journey time between Leeds and Manchester could increase average wages by between 1 and 2.7%**. Over time, this would represent economic benefits with a value of £7bn (2012 prices). The report showed that a reduction in travel times within the travel to work areas of individual cities of similar proportions would have an even greater effect on local productivity. These results demonstrate the importance of the Northern Hub project which will significantly improve rail connectivity between Northern city regions, but also the benefits from improving shorter distance commuter services.

" [It is] quicker to travel the 283 miles from London to Paris by train than it is to travel less than half that distance between Liverpool and Hull"

George Osborne, Chancellor of the Exchequer[47]

[42] 4.4million jobs within a 2km radius from rail stations served by Northern, TPE and Merseyrail.
[43] Within 5km from rail stations served by Northern, TPE and Merseyrail.
[44] See, for example, GVA Grimley (2006), How does transport influence business investment in the city regions?
[45] Mackie, P., Laird, J. and Johnson, D. (2012) Buses and Economic Growth II – main report. Institute for Transport Studies, University of Leeds. The precise figure is 17%.
[46] SERC (2009), Strengthening Economics Linkages between Leeds and Manchester: Feasibility and Implications. Report for the Northern Way.
[47] George Osborne ("014), *We need a northern powerhouse*, speech given at Museum of Science and Industry, Manchester, June 2014

4. Non-user benefits – rail's contribution to the wider economy

4.1. The previous section demonstrated that rail networks hold a high value for existing users. We have also set out the mechanisms by which this user value translates into improved productivity of businesses and individuals, higher economic output and lower government expenditure. But a key characteristic of public transport networks is that positive changes in demand can also have a large impact on non-users through reduced congestion, noise, accidents and greenhouse gas emissions.

4.2. In addition, there is good evidence to suggest that many people who choose not to travel by train on a regular basis place a stand-by, or option, value on the availability of train services[48]. Many others who do not plan to use the train at all value the fact that their family, friends and employees can reach them by train. Spread over a large number of infrequent and non-users, these benefits can add up to a large amount.

4.3. As we will show, rail networks also make an important, if often understated, contribution to the growth, efficiency and productivity of city centres and dense urban areas.

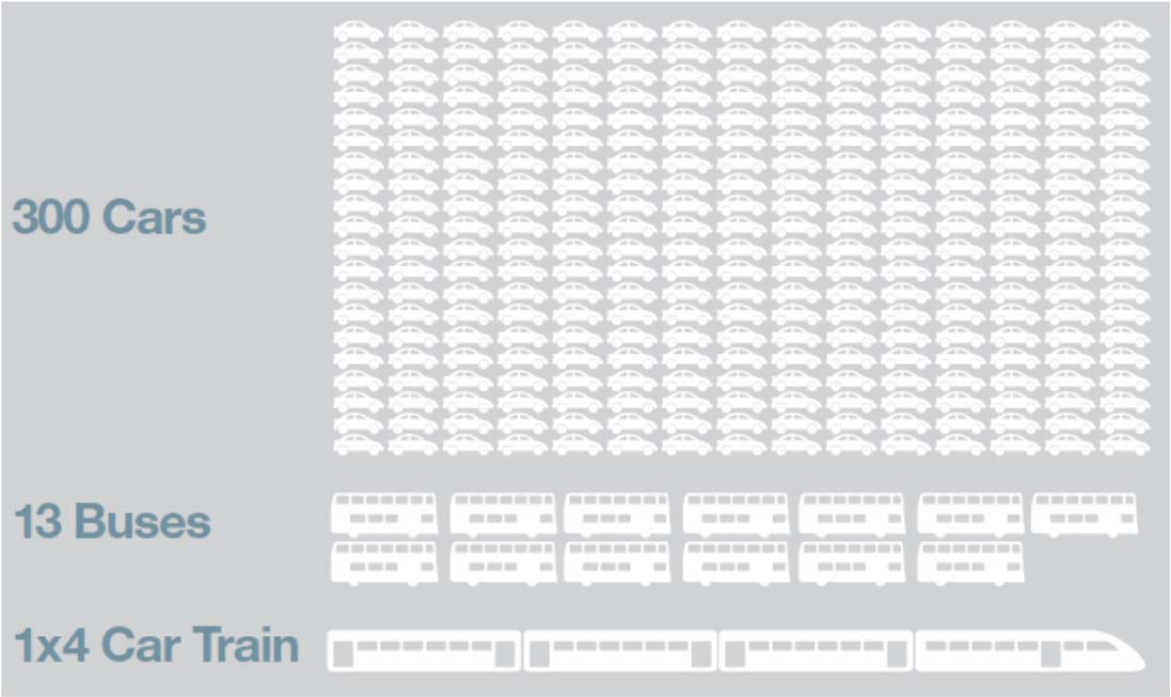
4.4. Across the North of England, these benefits together far exceed those accruing directly to rail passengers. This forms the cornerstone argument for public financial support of rail networks.

Decongestion benefits, accidents and environmental externalities

4.5. If a large proportion of peak rail trips were to transfer to cars, then roads would become significantly more congested, therefore resulting in millions of pounds of lost productive and leisure time. This effect is particularly significant in the case of rail since, as figure 6 shows, trains can carry large volumes of people into relatively small areas with large concentration of jobs much more effectively than private cars.

[48] Laird, et al (2009), "Option and non-use values and rail project appraisal", *Transport Policy* 16, pp. 173-182

Figure 6. Number of cars and buses required to carry the same number of commuters as a four car train



*Source: **pteg** (2014), Transport Works for Growth and Jobs; vehicle occupancy based on cordon counts around Manchester city centre.*

4.6. This provides a compelling case for why public authorities (who represent rail as well as other transport users) should ensure that rail networks provide an attractive and affordable service, in particular at peak times. This also helps understand why public authorities may decide to subsidise rail services or rail users directly. Not only is there a case to compensate rail passengers for choosing not to travel by car but there is an even stronger case to actively encourage this behaviour in pursuit of the common good.

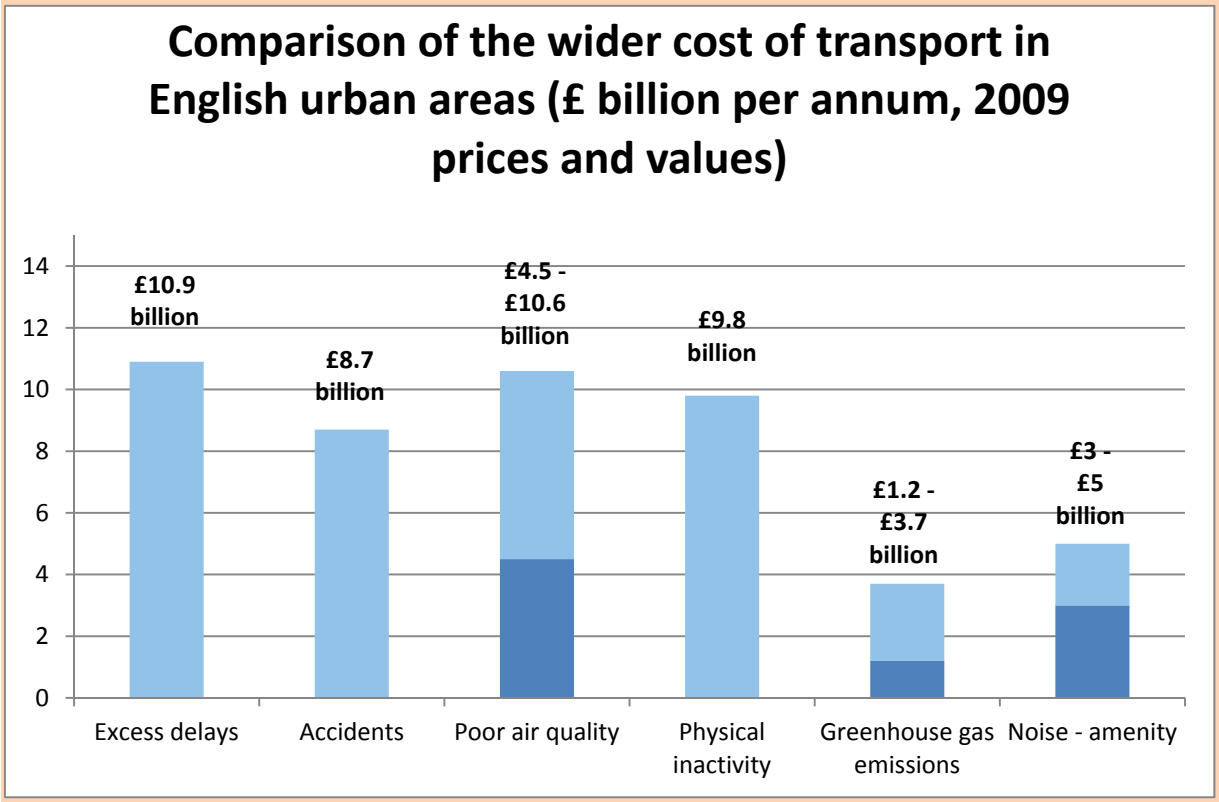
4.7. In order to estimate the value of decongestion benefits, we calculate the number of rail trips which would transfer to the private car in the absence of rail networks. Some trips would no longer be made as the additional cost and inconvenience, or lack of suitable alternatives (for example, for those without access to a car), would outweigh the benefits derived from the activities at the destination end. The majority of trips, however, would continue to take place, either by another form of public transport, by walking and cycling, by taxi or by private car.

4.8. In some cases, individuals would continue to travel but might change their destination to reflect the relative accessibility provided by different modes. This may have a further detrimental effect on the economic productivity of city centres, which we cover at a later stage[49].

[49] More generally, it is likely that the complete withdrawal of rail networks would have more severe consequences, which are difficult to capture through this relatively simplistic approach. In practice, this could give rise to the need for much more radical changes in land use, infrastructure requirements, individual behaviour and business models, which would have much greater costs in urban areas than we are assuming in this analysis. It is therefore likely that our work under-estimates the true non-user benefits of rail networks

The cost of road congestion

Road congestion in urban areas has been estimated by the Cabinet Office to cost the UK economy around £11bn a year, with additional external costs of between £27bn and £38bn in the form of accidents, pollution and other externalities. The delays and unreliability caused by congestion add to the end cost of consumer products, reduce the productivity of businesses and employees more generally, and therefore stymie the ability to innovate and access new markets and resources. Other externalities reduce the quality of life in urban areas, which has a direct impact on local workers and residents and constrains their future growth.



Source: Cabinet Office (2009), The wider costs of transport in urban areas

A survey of businesses by the British Chambers of Commerce (BCC) put the cost of congestion at around £17k per business per year. The same survey found congestion to be a problem for around 90% of businesses, with around 45% viewing it as a significant problem. The congestion problem is set to continuously worsen over time, especially in urban areas and the Eddington Transport Study suggested that its cost to the economy would double over the following two decades.

Sources: Cabinet Office (2009)The wider costs of transport in urban areas; BCC (2008)The Congestion Question: A Business Transport Survey; Eddington (2006) The Eddington Transport Study; www.transportworks.org

4.9. On average, we have assumed that 36% of current rail trips would become new car trips[50]. We have then used the assumptions in the Rail North demand and revenue model to allocate these new car trips between regions, area types (rural or conurbation), road types and by level of congestion. We then applied the estimates of

[50] This is based on the diversion factor from rail to car driver in table C2, WebTAG Unit A5.4 (44%), to which we applied a degeneration factor of 17%, based on recent unpublished DfT research into rail diversion factors on regional rail networks.

marginal economic costs recommended in the Department for Transport's Transport Analysis Guidance (WebTAG) to estimate the economic impact of these additional car trips on congestion, road accidents and the environment.

4.10. Our analysis shows that Northern rail networks generate **£216m** in decongestion, reduced accidents and environmental benefits. This is equivalent to 51% of net economic benefits to users themselves and represents an **average non-user benefit of £1.93 per rail trip**.

4.11. Notably, close to 80% of these non-user benefits materialise in the three conurbations surrounding Manchester, Leeds and Sheffield. And over 40% result from reduced congestion on the most heavily trafficked routes at the busiest times of day.

4.12. Assuming that these 40% of non-user benefits are entirely due to rail travel to/from Manchester, Leeds and Sheffield in the peak travel direction during the am and pm peak hours, we estimate that **each of these peak rail trips generates £6 in non-user benefits**[51]. This is more than twice the net economic benefit accrued by a typical season ticket user. For a typical peak commuter travelling daily by train, this equates to a **non-user benefit of £3,120 per year**, compared to a net user benefit of £1,250.

Option and non-use values

4.13. The economic assessment of rail networks tends to focus on rail passengers and those users of other transport modes who benefit from reduced congestion. However, evidence shows that those people who could use the railway network but do not do so at present also place a high direct value on the availability of rail services[52]. This stems from two main sources: option value and non-use value.

4.14. **Option values** represent the price which individuals are willing to pay to have the **option** of consuming a good at some point in the future. Option values are additional to the direct economic benefit from actually consuming the good. Insurance is a good example of a good with a high option value – even though the majority of people who buy insurance will never come to use it, they are still willing to pay a high value just for the option of being able to do so in the future.

4.15. It is easy to think of circumstances which would cause individuals to place a high value on rail networks. For example, they may need to use rail during periods of bad weather or, more generally, when other transport modes aren't available (such as when the car is in the garage). But rail services may also offer the future opportunity to access a wider range of jobs or housing options.

4.16. **Non-use values** represent economic benefits to individuals which are unrelated to their own use or future use of the service. The majority of non-use value tends to relate to indirect user benefits, for example, where parents no longer need to escort children when they are able to use public transport themselves or where individuals are visited by family and friends who travel there by train. Another good example of non-use value is decongestion benefits although these have already been accounted for in a previous section.

[51] Number of passengers in am/pm peak direction and peak hour into and out of Leeds, Manchester and Sheffield estimated at 55,000 per day, based on DfT Rail Statistics table RAI0202; assumed 260 working days per year.
[52] Laird, J. Geurs, K. and Nash, C. (2009), "Option and non-use values and rail project appraisal", *Transport Policy* 16, pp. 173-182

4.17. Previous research has found option and non-use values for local rail services as high as £238 per household[53]. UK transport appraisal guidance recommends a slightly lower figure of around £209 to take into account possible double-counting, which would be applied to households living within 2km of a rail station with a good commuter service into key local employment centres. For areas with lower quality of service, where it may be less feasible to commute by train, other research (Johnson et al, Laird et al) has suggested considerably lower figures. In this report, we adopt a figure of £71 per household based on Laird et al[54].

4.18. In order to estimate the overall option and non-use value for the rail network in the North of England, we have estimated the number of individuals within a 2 km catchment of the stations served by NT and TPE, based on 2011 Census figures for population at ward level. We then split stations into those within the travel to work catchment of main urban centres and those outside[55]. Our results, presented in table 4, show total option and non-use value of nearly £700m per year, which is of a similar order of magnitude as user benefits and decongestion/external benefits combined. This relatively high figure highlights the fact that rail services have the potential to benefit a large number of people even if they are only used by a relatively small proportion of the population at any one point in time. This, in itself, provides a powerful rationale not only to subsidise the provision of the rail network from general taxation but also to ensure that the rail networks offer comprehensive coverage of the country.

Table 4. Option and non-use values for the rail network in the North of England[56]

	Population (million)	Households (million)	Option/non-use value per household (2012 prices)	Total option/non-use value (£ million)
City region travel to work areas	6.9	3	£209	627
Rural stations	1	0.4	£71	28
Total / average	7.9	3.4	£203	655

Denser and more productive urban economies

4.19. As we demonstrated earlier, rail networks make an important contribution towards the free flow of people and goods in urban areas. This has a direct impact on business costs and individual quality of life, which translates into additional economic output.

4.20. However, decongestion benefits simply measure the direct impacts in terms of reduced journey times. For certain industries, an efficient urban transport network, providing

[53] Humphrey and Fowkes (2006) found option values of £190 in 2002 prices. The £238 figure is in 2012 prices.
[54] Laird, J. Geurs, K. and Nash, C. (2009), "Option and non-use values and rail project appraisal", *Transport Policy* 16, pp 173-182
[55] The latter were defined as the stations in the following counties/districts: Derbyshire (excluding Peak District) to reflect the fact that stations between Sheffield and Nottingham are well served by operators other than Northern and TPE.
[56] ***pteg*** analysis of 2011 Census data; option/non-use values based on research by Humphreys and Fowkes (2006) and Laird et al. (2009); all figures rebased to 2012 prices.

high accessibility to town and city centres, can generate additional second order productivity impacts. While there are several reasons for this[57] we would argue the two following factors are key:

- urban centres offer the opportunity for significant agglomeration economies, by allowing close proximity and greater interaction with competitors, clients and suppliers;
- a highly accessible central location maximises access to a wide and more specialised labour pool.

4.21. For producer and consumer services in particular, these second order productivity impacts can give businesses an important competitive edge and make a substantial contribution towards aggregate economic output. In this section we attempt to quantify the contribution of rail networks in the North of England to this type of benefit. We look at this issue from two different perspectives:

- by assessing the constraints that the absence of rail networks would place on city centre employment density;
- by following the DfT's wider economic impacts methodology, which is based on the empirical relationship between effective density (and implicitly the degree of congestion) and business productivity.

4.22. Starting with infrastructure constraints, information collected through cordon traffic counts around the largest cities in metropolitan areas in the North of England suggests that car and rail make up, respectively, 40% and 15% of all peak travel into city centres. Assuming that, in the absence of the rail network, there would be a 36% diversion of rail journeys to new car trips[58] this would equate to a **13% increase in peak car travel**. Assuming the radial road network serving metropolitan city centres is close to full capacity and could not accommodate the additional traffic, this would equate to a 5.2% loss in city centre jobs[59]. Added to the number of commuting trips[60] currently made by rail, which would no longer take place (implying associated jobs would be lost), **this would equate to an overall 7.8% loss in city centre jobs or over 25,000 jobs in central Leeds and Manchester alone, equivalent to more than £1.2bn in lost GDP**[61].

4.23. But even if one were to assume no jobs were lost due to transport infrastructure constraints, those businesses located in congested areas would become less productive due to increasing difficulty in accessing a wide labour market and interacting with other businesses. The Department for Transport has developed a methodology for estimating these types of effect, known as Wider Economic Impacts[62]. In this report we concentrate on estimating agglomeration benefits[63], the largest of these impacts, which

[57] See www.transportworks.org for a detailed explanation of the range of evidence demonstrating the link between productivity and improved transport networks.
[58] This figure already takes into account car occupancy and therefore reflects a diversion factor between rail and car kms.
[59] Assuming car trips make up 40% of city centre commuting/peak traffic.
[60] Assuming rail trips make up 15% of city centre commuting/peak traffic and a degeneration factor of 17%, based on DfT research into diversion factors, this would equate to 2.6% of jobs.
[61] This takes GDP per worker figures from WebTAG Unit 3.5.14, and assumes half of all jobs in central Leeds and Manchester are in producer and consumer services. Based on the 2008 Annual Business Inquiry survey, there are around 168,000 jobs in the two central wards in Leeds and a similar number in the four central wards in Manchester.
[62] DfT (2012a), Transport Analysis Guidance Unit 3.5.14: The Wider Impacts Sub-Objective
[63] These are known as WI1

are defined as the increased productivity that results from a greater effective density[64] of jobs in a given area.

4.24. Based on information built into the Rail North demand and revenue model, we estimate that, in the absence of regional rail networks, **there would be an overall loss of productivity in key urban centres across the North of England of £288 million per year**. Note that this figure is likely to be an under-estimate of overall wider impacts as there are some types of benefit which we were unable to quantify due to lack of data[65]. Once these benefits are taken into account, it is likely that wider economic impacts come to exceed £300m per year. In any case, our analysis suggests that agglomeration benefits exceed the decongestion, reduced accident and environmental externality benefits calculated in a previous section. This reflects the fact that rail networks not only reduce road congestion but also directly improve the connectivity between businesses. Should rail services no longer be available, there would be an instant reduction in economic density which would particularly affect the degree of interaction between businesses locating in key urban centres.

4.25. In conclusion, there are significant productivity benefits as the result of the greater proximity between workers/businesses which rail networks enable. They do this by providing fast direct links to key employment centres and by taking traffic off the roads. Based on our broad assumptions, rail networks in in the North of England generate close **to £300m per year** in agglomeration benefits. In the short term, however, the absence of rail networks, and the gridlock which this would entail, could reduce the contribution of these city centre areas to national GDP of over £1.2 billion per year.

[64] Effective density is based on the travel cost and time required to reach neighbouring businesses in a given area.
[65] We have excluded from our analysis labour market impacts (WI4) and the increased output in imperfectly competitive markets. We have also assumed GDP per job not to vary by location. In practice, within a given sector, city centre jobs are likely to generate a greater economic output per worker.

Why are firms and workers attracted to town and city centres?

There are two key mechanisms through which transport investment can produce wider economic benefits beyond those that would arise under perfect competition conditions: agglomeration economies and labour market effects. These are critical in explaining why people and businesses are so attracted to urban areas.

Agglomeration economies occur where lower transport costs bring firms closer together, resulting in lower unit costs and higher productivity. Urbanisation economies (a form of agglomeration economies typical in large cities) arise where firms from a range of industries are able to benefit from the concentration of shared resources, competitors and clients. Shared resources can include physical infrastructure, centres of knowledge and research, labour pools as well as shared intangible goods such as information, knowledge, business culture and technological innovation, all of which can have a cumulative effect on productivity.

"Interaction between activities produces agglomeration forces which preserve the local concentration of activities"[66]

Lower transport costs can have a significant impact on **labour markets** by promoting the relocation of jobs to more accessible, higher productivity areas, by widening labour search areas and by encouraging more people into work through reduced commuting costs. These effects can have a positive impact on taxation revenues and total economic output[67].

Empirical evidence of agglomeration effects and their impact on productivity

There is a growing consensus that transport infrastructure can have a significant impact on productivity. A comprehensive literature review[68] suggested that a doubling of city size would increase productivity by somewhere between 3-8%, implying an elasticity of productivity with respect to city size in the range 0.04-0.11.

A more recent UK study[69] estimated average elasticities of 0.04 for manufacturing and 0.12 for service industries as a whole. The impact of economic density on productivity is highest for financial and business services, with a weighted elasticity of 0.2. The impact of economic density on productivity is even higher for specific sub-sectors such as business and management consultancy.

This growing body of research was reflected in the findings of the Eddington report, which recognised that transport investment has the potential to grow GDP, productivity and employment at a faster rate than is typically assumed in standard transport analysis. The Department for Transport has since published TAG Unit 2.8 on Wider Impacts and Regeneration, which provides guidance on how to quantify wider economic benefits from transport.

"It seems clear that transport networks will continue to play an increasingly crucial role in supporting the success of these urban agglomerations: enabling commuting journeys to support deep labour markets; facilitating rapid business to business contacts; and providing international connections to support the export of high productivity services"

Eddington Transport Study (2006)

[66] Vickerman, R. (2007), Recent Evolution of Research into the Wider Economic Benefits of Transport Infrastructure Investments
[67] Venables, A. (2004), Productivity effects of urban transport improvements
[68] Rosenthal, S.S. and Strange, W.C. (2004), Evidence on the nature and sources of agglomeration economies
[69] Graham, D. (2006), Wider Economic Benefits of Transport Improvements

5. Supply side impacts – the rail industry's contribution to national economic output

5.1. Previous sections in this report have attempted to quantify the **net economic benefits** generated by passenger rail networks in the North of England. This analysis largely discounts any benefits that may arise on the supply side, for example, in terms of direct rail sector employment. This is based on the assumption (which comes as standard in welfare economics) that the economy is operating at full capacity, meaning that any increase in employment due to the operation of the rail sector actually comes at the expense of a reduction in employment elsewhere, hence having a neutral effect on aggregate output.

5.2. However, national economies are seldom operating at full capacity, and this is particularly true in the wake of the recent economic crisis. Hence, all things being equal, there is a case for directing public spending towards those policy areas with the greatest spending multiplier, i.e. those that generate the greatest amount of economic activity from a similar amount of public funding. The purpose of this section is to set out the supply-side economic impact of rail networks in the North of England.

5.3. Train operating companies need to employ drivers, depot and office staff, acquire and maintain trains, purchase fuel or electricity and buy, rent or build depot and office space. On the other hand, Network Rail needs to employ staff and buy plant and equipment in order to maintain and develop infrastructure. Employees and suppliers to the rail network then use the money earned to acquire goods and services from other parts of the economy. This sequence of events generates economic activity, which is taxed by government, and eventually reflected in national accounts.

5.4. NT and TPE together have an annual turnover of £834 million, £395 million from the fare-box, £376 million in operating subsidy from government and £63 million from other commercial income sources[70].

5.5. A significant proportion of this revenue then goes towards staff costs (31%), including tax and national insurance contributions, rolling stock (23%), headquarters, maintenance and fuel costs (23%). Close to a fifth of total income is paid out to Network Rail as a contribution towards infrastructure upkeep while the remaining 6% reverts back to owning groups and can be re-invested back into the business. Excluding Network Rail charges and group profit margin, NT and TPE's total expenditure comes to £636 million. Of this figure, we estimate that over two thirds **(£425 million**) flow directly to the local economy. Most of the remaining expenditure goes towards rolling stock leasing charges and fuel costs, a proportion of which will also flow to the economy of the North of England.

5.6. In addition to the money received from the two train operating companies (£148m), we estimate that Network Rail spends an additional £523 million on the local network in the North of England. A small proportion of this (£69m) is funded from other sources of commercial revenue, such as real estate income, whereas the remaining £454 million come through a government grant and supported borrowing[71]. Based on fairly

[70] DfT and Rail North (2014) Stakeholder Consultation: TransPennine Express Rail Franchise and Northern Rail Franchise
[71] Source: ***pteg*** (2014), A heavy load to bear? Towards a fairer allocation of rail industry costs for regional rail.

conservative assumptions[72], we estimate that at least a third of Network Rail's total expenditure **(£222 million**) flows directly to the local economy.

5.7. In total, **the regional rail network in the North of England is worth close to £1.3 billion in direct economic output, at least 50% of which flows directly to the local economy**. Of this total expenditure, we estimate that around £750m is funded from direct government grants and government-backed borrowing by Network Rail.

5.8. Turning to rail jobs, NT and TPE directly employ 6,000 staff. Based on the share of Network Rail spending which goes towards local rail networks in the North of England (7.4%), we estimate that this supports a further 2,600 jobs. Research quoted by Invensys Rail suggests that every ten additional direct jobs in the railways generate 14 indirect jobs elsewhere in the economy.

5.9. Assuming the same job to expenditure ratio in the supply chain as for direct rail jobs, this evidence suggests that the rail network in the North of England contributes:

- £3.1bn in direct and indirect economic output, at least **£1.6bn** of which remains in the regional economy;
- **20,600** direct and indirect jobs in the local economy.

5.10. Given the government's total annual contribution of £0.75 billion[73], this represents a **fiscal multiplier of at least 2.1:1**, taking the North's economy alone, and government spending of **£36,700 for every local job supported**, making the rail network an effective regional growth tool

[72] The figure quoted is based on half of NR's expenditure on maintenance, renewals, enhancements, signalling and operations management (assumed to be the share of expenditure going directly towards staff costs).
[73] Including supported borrowing, operating subsidy and Network Rail grant.

Investment in the rail network – an opportunity for the North's and the UK's global engineering and consultancy industry

Regional rail demand has boomed over the past decade. Yet, investment in infrastructure and rolling stock has not kept up (see figure 7). The Chancellor George Osborne recently argued that "the transport network in the north is simply not fit for purpose – and certainly not good enough[74]" The Northern Hub project and the electrification of core routes will begin to address this gap over the coming years. Allied with the need to replace a large proportion of the North's ageing fleet with modern electric trains, this could create significant opportunities for UK companies to create local jobs while continuing to develop their global expertise in rail engineering, design and manufacturing.

Below are a number of UK based international companies with major dealings in the rail industry.

Hitachi

Hitachi is a leading global rolling stock manufacturer having built vehicles such as Japan's Bullet Train. Hitachi have recently been awarded the £5.8bn contract to replace the aging Inter-city rolling stock, following which they have announced major investment in the UK, relocating their global headquarters to England, and building a new £82 million construction facility in the North East. Initially, this will see 730 new manufacturing jobs created, a figure that could eventually grow to 1,800.

Hitachi is seeking to use the new UK base to expand their operations, including the provision of high-speed trains in Germany and other European countries.

Doncaster rail cluster

Doncaster has developed as a considerable centre for manufacturing, with over 10,000 people employed in the sector. The rail industry plays a central role, with a significant core of manufacturing and specialist services in the area. For example, Hitachi have chosen to locate their future maintenance depot for the new Inter-city train fleet here. Other companies in the cluster are listed below:

DB Schenker is the second largest transportation and logistics provider in the world. Their UK head office in Doncaster employs 300 people, and supports their UK operations.

Wabtec rail limited is one of the largest companies involved in refurbishing and overhauling rolling stock in the UK. They have worked on major projects such as the upgrade of carriages for East Coast services between 2006 and 2009 and the recent upgrade of South Western's train set.

With a turnover of £120 million in 2012 and over 900 employees Wabtec is a significant regional employer. With an average wage of almost £30,000 per year, they provide a significant boost into the local and regional economy.

Other companies include:

Trackwork Moll, produce 400,000 concrete sleepers per year, employing 45 people. Their plant opened in Doncaster in 2013.

[74] George Osborne (2014), We need a northern powerhouse, Speech at Museum of Science and Industry, Manchester

Volkerrail Group, a leading contractor providing railway infrastructure services such as track renewal and maintenance. They employ 532 people in the UK, with a turnover of £133 million in 2012.

Trackwork Ltd, design, install and maintain rail track and manufacture components for rail networks.

Unipart Rail, a leading distributor and supplier of engineering parts and components to the rail industry. As a group, they turned over £182 million in 2012, employing 812 people in the UK.

Doncaster International Railport, run by the Freightliner Group is a freight terminal which handles 37,000 deep-sea containers a year, and receives three trainloads a day. With the three regions of the North being either the origin or destination for 40% of rail freight tonnage, freight handling services such as this contribute significantly to the local economy[75].

And it is not just manufacturing that the UK has developed strong international expertise in. The UK is also a global leader in engineering design and consultancy services.

Atkins

WS Atkins is the largest UK engineering consultancy and a major global player, with annual turnover in excess of £1.7bn and over 16,000 staff. Between 2011 and 2013, Atkins earned almost half of its income from overseas clients and paid the Exchequer close to £44m in corporate tax.

Atkins has a strong international presence in the rail sector. It has recently been appointed as the Preliminary Engineering Consultant to finalise plans for the £11 billion 1,200km Etihad railway across the United Arab Emirates and it is also involved in delivering the European Rail Traffic Management System (ERTM). Atkins also prepared detailed designs for South Africa's first high-speed train line ahead of the Football World Cup in 2010[76].

Mott MacDonald

With turnover in excess of £1.2bn and 14,000 staff, Mott McDonald is a major employee-owned engineering design consultancy specialising in transport infrastructure.[77] As in the case of Atkins, Motts has historically earned close to half its income from foreign clients[78]. Motts has shown strong growth over the past decade, doubling its turnover and increasing its staff by 50% between 2005 and 2013. Between 2011 and 2013[79], Motts paid the Exchequer £38m in corporate tax.

Motts employs 1,500 professionals working on high-speed rail projects alone. Having been heavily involved in the development of High Speed 1 in England, this experience and knowledge has been transferred to the development of High Speed networks in China, California, Holland, India and Taiwan[80].

[75] Information for the Doncaster case study taken from: DB Schenker, About DB Schenker, http://www.rail.dbschenker.co.uk/ , Business Doncaster: Rail Industry, http://www.businessdoncaster.com/locate-in-doncaster/about-doncaster/key-sectors/rail-industry/, information found on the Wabtec website, Railway technology at www.railwaytechnology.com and the Fame Database
[76] Information for this case study based on: the Fame Database
[77] Fame database
[78] Latest available information is from year ending in December 2007. Since then, Motts has not published a statement of foreign income in its corporate accounts.
[79] Fame database
[80] Mott MacDonald website, High speed rail, https://www.mottmac.com/transport/rail/high-speed-rail

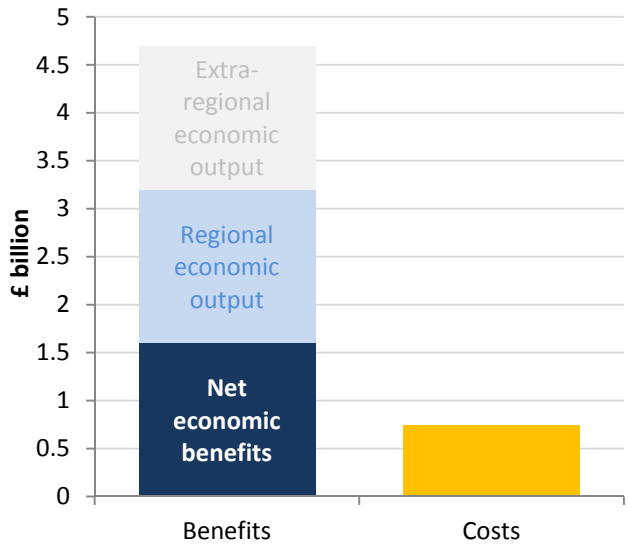
6. Value of the regional rail network in the North of England – an economic balance sheet

6.1. NT and TPE carry more passengers each year that all inter-city operators put together, and more passengers than Welsh and Scottish franchises combined.

6.2. TPE experienced passenger growth of 92% from 2004 to 2014, reaching 25 million passengers per year. NT experienced growth of 38% over the same period, reaching 89.9 million passengers despite the franchise being awarded on a no growth basis.

6.3. In this report, we have shown that the network of rail services operated by Northern Rail (NT) and Trans Pennine Express (TPE) across the North of England has a high economic value.

Figure 7. Economic value and government-backed costs of the rail network in the North of England



6.4. This value is realised, **firstly**, by linking workers to jobs, businesses to other businesses, students to education opportunities and households to shopping and leisure activities. In the absence of rail services, this economic activity would become less efficient and productive or might otherwise not take place at all.

6.5. **Secondly**, the rail network delivers even larger economic benefits to those individuals and sectors of the economy which do not rely on passenger trains directly but benefit from their use by other people. This includes reduced road congestion for car users and freight companies, access to wider labour markets and more productive workers for firms, and greater density of economic activity in key centres, which has been shown to drive up productivity.

Crowded platform at Manchester Piccadilly

6.6. **Thirdly**, rail networks have been shown to hold a high option or insurance value for those households which, while living close to the rail network, do not currently use it. This value relates, for example, to the possibility that, in future, the availability of rail services could enable access to a better job or a more desirable home.

6.7. Overall, this wide range of economic benefits are valued at close to **£1.6 billion** per year, or around **twice** the amount of rail funding provided through government grants and Network Rail borrowing.

6.8. Notably, **only one quarter of economic benefits accrue to rail passengers themselves**, which provides a clear-cut case for government funding.

6.9. In addition to these net economic benefits, which can be thought of as added value, spending on rail networks in the North also has a supply-side effect on the economy, with an estimated direct and indirect contribution to regional economic output of around **£1.6 billion**, supporting **20,600 jobs**. Taking the national economy as a whole, spending on Northern rail networks delivers an extra **£3.1 billion in economic output**.

6.10. Taking net economic benefits and regional supply-side impacts together, Northern rail networks **deliver £4.30 of economic value for every £1 of direct government support** and government-backed borrowing. Once extra-regional economic impacts are taken into account, this takes the figure to more than £6 of economic value for every £1 of government backing.

6.11. Our analysis demonstrates that, despite what seem like relatively high values of operating subsidy, Northern rail networks deliver considerably higher economic benefits to non-users. Moreover, the significant direct and indirect contribution of rail spending to local economic output suggests that this form of spending can work well as a tool of regional cohesion and local economic development.

Table 5. Economic value and government costs of North of England rail networks *(£ million, 2012 prices)*

BENEFITS			COSTS	
Net economic benefits			**Government-backed funding**	
User benefits	*400*	**1,600**	Direct grants	*475*
Decongestion, accidents and environmental impacts	*220*		Network Rail borrowing[81]	*275*
Agglomeration	*290*			**750**
Option and non-use value	*650*			
Supply side impacts				
Regional economic output		**1,600** (20,600 jobs)		
Extra-regional economic output		**1,500**		

[81] The split between government grants and Network Rail borrowing assumes a similar ratio applies to every Train Operating Company. In practice, NR borrows as a lump sum and this money is therefore difficult to allocate. These figures should therefore be interpreted as merely illustrative.

pteg Support Unit
Wellington House
40-50 Wellington Street
Leeds – LS1 2DE

T 0113 251 7204, **E** info@pteg.net, **W** www.pteg.net